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ARCHITECTURAL COMPOSITION

GENERAL PRINCIPLES

By Professor H. Wagner

PROPORTIONS IN ARCHITECTURE

By Professor A. Thiersch

DESIGN OF THE BUILDING

By Professor H. Wagner

TREATMENT OF EXTERNAL AND INTERNAL ARCHITECTURE

By Professor J Bühlmann

ENTRANCES, STAIRS, COURTS, AND HALLS

By Professor H. Wagner

Second Edition

*Translated by N. Clifford Ricker
Dean of College of Engineering*

ARCHITECTURAL MIMEOGRAPH PRINT

UNIVERSITY OF ILLINOIS

URBANA. ILL.

1900

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PROBLEM AND AIM OF ARCHITECTURAL CREATION.

By Professor Wagner.

1. Primary Ideas.

Every building and work of human creation must serve a definite purpose. For fulfilling this purpose, that building is most suitable, to which an appearance and form are given, suited to the purpose of the building and pleasing to the eye. To understand these requirements more accurately, the primary ideas in Architecture must here be stated.

For the structure to fulfill its aim, it must first accord with the material conditions, which are subject to constant change, for development and refinement of civilization have modified the primitive and simplest requirements of life, continually producing new deeds and new problems in manifold variety. An infinite domain is opened to man's creative impulse; no problem is so minute as to be unworthy his mind, none too great for his grasp. However diverse the conditions, the laws for their treatment are invariable. We obey the eternal rule of nature, evident in its lowest and its highest organisms. For the work of man to completely fulfill its purpose, like the products of nature, each part must fulfill the function assigned to it and take the appropriate form. The entire structure must be a truthful expression of the ideas, that called it into existence.

If the work has an ideal meaning as a worthy monument of human creation and is to endure to future ages, then must it likewise suit the tendency of the human mind toward elevation and perfection, and must appear in graceful and beautiful form.

2. Nature of Architectural Creation.

This gives the requirements that clearly distinguish works in architecture from creations in other arts. Painters and sculptors execute while they conceive and require no assistance from others. Not so with the Architect. For the creative mind is in architecture more intimately connected with the material than in other arts: it is subject to the laws of science, must satisfy conditions of construction, and for the embodying its results, requires combined efforts of many men and expenditure of money not necessary in Painting and Sculpture, still less so in Poetry and Music.

In every branch of knowledge, the judgement chiefly executes the erection of the building by the art of construction. But if this is to become an architectural creation, knowledge of the true must be joined with perception of the beautiful, aided by imagination. It is not sufficient for the creative idea to be clearly and truthfully expressed; it must appear in judicious forms, pleasing to the eye, to be understood. It is not enough for each part to receive the form best adapted to the requirement assign-

ed to it in the entire organism; this form must at the same time be beautiful. In representing the beautiful, it is primarily essential to invest the exterior of the building with artistic forms, according to the law of the style; art forms are less easily understood and do not act on the feelings so directly, as in the modes of expression of other arts, since they belong to a language to be learned from nature. For most works in architecture, both the appearance of the exterior and that of the interior are to be designed and harmonized; each room and each part of the building must have that effect suited to its purpose. Parts of the structure enclosing space are to be so grouped and divided as to present on all sides a pleasing effect, just as required for works of Sculpture. Local and climatic conditions are to be considered, and affect plan, arrangement, and also treatment of forms.

These can only obtain the consecration of art by regularity in arrangement and harmony of proportions, attaining perfection by appropriate decoration and splendor of color. This requires the power of imagination, not confused by any difficulties, able to grasp the peculiarities of the problem and to deduce therefrom suggestions for characteristic expression. This requires the assistance of Painting and Sculpture, for which Architecture creates locations for effective treatment of their reproductions, in order to bring forth in combination with them the most perfect and most sublime works of the formative arts.

These indicate the paths to be followed by the creative thought in architecture, and the aim to be reached. For architectural composition or design is a condensation of science and knowledge, that experience, science and art required from the creator of the building. It manifests the triad of ideas summarized in fulfilment of purpose, truth of idea, and beauty of form.

3. Two-fold Problem of Architect.

The artistic side is therefore emphatic in designing a building, but is not the sole problem of the architect in architectural composition, his labors not ending with it. If a master of his art in the full sense, his creation only terminates with the completed structure, and to realize this, he must be both master of form and construction. He must be such in conceiving, and still more in completing the design, for the construction is the means of its realization. As constructor, he selects and employs the building materials according to their natural peculiarities and conditions; by the aid of science and experience, he chooses the method and system adapted to the materials; he dimensions parts of the structure in accordance with their loads, and arranges them to best suit their purpose.

18.

ARCHITECTURAL COMPOSITION.

Their formal treatment is then by the artist.

Prepared thus and clearly set forth in words and drawings, accurately dimensioned and estimated, the work is ready for execution.

A new series of labors of the architect begins when he is the creator of his work in the fuller sense. Execution and conception in architecture, as in every art are most intimately connected. The designer of the building must give it the stamp of his mind, even its smallest details, and as its overseer, must fill assistants, foremen and workmen with this spirit, to set stone on stone, join member to member, and create a work in which the law of harmony and the unity of design may fully appear. What was devised in an hour of inspiration, and was built up in his mind during long days of contest with external and internal requirements, demands months and years of continuous labor, the work of skillful hands under the architect's guidance, and he must aid the performance of their duties, must watch over them, and their claims and demands must be subject to his examination and control.

4. Problem of Builder.

With the beginning of the practical duties of the architect, the work enters a new phase, has passed under the superintendent of construction, and by his knowledge of business, of expedients in each branch of his calling, he is to aid the architect in his comprehensive and difficult problem. he supplies the best materials for the work, prepares this in workshops and at the building, combines it according to directions and rules, arranges the labor as most rational and preferable, and erects the building rapidly and in a masterly manner.

We enter here the domain of the superintendent of construction, not to diminish it, but to fix its limits and protect the creative realm of the architect from encroachment. Each has a broad and fruitful field; the trades to the superintendent and arts to the architect. Each should be content with his own and not encroach upon another. The limits of each domain are so extensive, that human life does not suffice to exhaust them. The entire energy and intelligence of the one are due to the increased requirements of his calling, and the entire talents of the other to truly solve the high problems of his art. Even in works of lesser importance, the master of trades and the master of arts should work together.

5. Division of Architectural Labor.

The power of invention acts together with the creative force of thought; thus the purely artistic labor of the architect differs from his scientific duties as a constructor. A division of labor is possible in many cases, and even to be desired, although union in the same person with

astery of science and knowledge is possible. It is always necessary for the architect to also, be a constructor; but is not required for the constructor to be an architect as well. For the former is the realm of judgement; for the latter is the domain of creative imagination, or as in the motto of the beginning of this division; for one is the prose, and for the other the poetry of the art.

6. Designing.

To enter the domain of architecture, comprised in the last division of this handbook, we have decided to accompany the architect to the end of his problem, which is the embodiment of the design made by him. We have therefore followed his work from the primary requirements and its first conception; have passed over the broad domain of his creation and his labors to build up a clear idea of the branches, to which all other trainings converge, the design, plan, and arrangement of the building. The important may be briefly summarized.

The plan of a building appears in the design, and in order to design a building, one must be a master of construction and a master of form.

To me a master of construction means:--

1. An acquaintance with nature and properties of building materials, and a correct knowledge of statics, to compose elementary structures and to combine them into rational systems and useful members of an architectural organism.

2. Possession of ripe experience, to pay due regard in construction to technics of trades and requirements of mode of execution.

3. Addition to this knowledge of whatever may be necessary to make effect of exposure to weather least, and to conform the building to requirements of sanitary science.

These branches must be assumed as known in designing and planning buildings. He must also satisfy the second condition and be a master of form, which signifies:--

1. Innate talent and an active mind, with an earnest impulse to create sublime and beautiful things.

2. Accurate knowledge of masterpieces of art, grasping the meaning of their forms, and fathoming the nature of architecture, to be equal to its problems.

Ripe judgement and self-knowledge, to be able to embody the creations of his imagination in accordance with the unchangeable laws of architecture.

Where may the architect find art forms more beautifully and completely developed than in the best architectural periods? Where may the design and construction of monuments be better studied, than in the styles of

great periods? These branches of training are therefore assumed. In designing and planning buildings, we have only to apply these primary branches and to draw our conclusions.

Whoever has made all these branches of science and art his intellectual property and has grasped the requirements of the problem, derived from custom, habit and from civilized life, possesses the science and knowledge, whose essence is architectural composition.

Architectural design must also combine truth of thought, beauty of form, and fulfilment of purpose. These are the primary laws, which must first be understood with perfect clearness. These were succeeded by studies of proportions in architecture, of planning buildings in general and in detail, of treatment of forms of external and internal architecture, and the more or less developed vestibules and corridors of buildings.

7. Science of Building.

This academic essay is now followed by what is briefly designated "Science of Building". This comprises thorough consideration of all kinds of buildings, arranged in divisions, each comprising several sections. The course for each species of building, after a brief glance at its historical development, is that the requirements of the building, its form of plan, treatment and arrangement are investigated and deduced from its purposes and uses, from tradition and the progress of civilization. Typical examples serve as illustrations.

The title expresses limitation to a definite creative field exclusively belonging to the architect. As structures should be classed all extensive works of engineers, bridges and tunnels, hydraulic and harbor works, compared with the works of the architect as corresponding to them, and which must be regarded as suitable objects for the effective development of architecture. Yet for convenience, a division of the work between the architect and the engineer was long since made, and we shall therefore omit structures where conditions of use and suitability do not permit requirements of art to assume control, and those in which technical conditions are to be fulfilled. But all in which artistic force predominates, or is not entirely suppressed, from the smallest problems, content with grace and effect obtained with the most limited means, up to the most important undertakings of art, for whose execution the labor of an entire generation is required, will be subjected to critical consideration, while we study their typical peculiarities.

"Architectural Composition" and "Science of Buildings" necessarily belong together and materially extend each other. We have clearly fixed the ideas of both and have limited their domains. Architectural Compo-

sition is the general and theoretical portion, the Science of Building being the special and practical part.

SECTION 1.: GENERAL PRINCIPLES.

By Professor Heinrich Wagner.

8.: General.

What is the nature of Architectural Composition, what does it comprise, and where did it originate? We recognize it as the result of knowledge and skill, drawn from experience and collected from the realms of science and art. But to find its origin, we must penetrate more deeply. For a proper answer to these questions, we must return to primary ideas.

To compose or design, one must first know what he would create. This is to have an idea, and this idea or mental image of the object is brought out in full clearness and representation by drawings. Architectural designing is therefore a clear representation of a creative thought. Seeking light and clearness, the mind searches for general laws of treatment, infers causes from effects, and reaches a simple ground law, the basis of all, and which prevails in the realm of art, as in that of nature. This is the eternal law of evolution, that primarily exists in creations of the organic world, which the organism calls into existence when conditions for its vitality exist, permitting it to grow and thrive, if each separate organ fulfils its function, when it assumes the form appropriate thereto. Nature takes care that this shape may be truthful and beautiful, if the organism really fulfils its life purpose.

Transferred to the domain of architecture, we have (Art. 2) deduced from this the ground law of architectural composition. It starts from that triad of ideas; fulfilment of purpose, truth of thought, and beauty of form, the roots of the tree of theory; it will develop and blossom under the influence of three fructifying forces, experience, science and art. The path to creative activity thus indicated leads through the realm of mental contemplation. But we must still limit ourselves and make prominent the chief points, which architectural design must keep in mind.

Chapter 1.: Suitability and Durability.

The requirements of civilized life increase the problems of architecture infinitely, since progressive development and improvement of external and internal conditions of life produce needs of all kinds, which cause new creations in architecture, always with the impress of time. These needs of life are subject to perpetual change and are also the conditions of existence of the building; civilization is the fruitful field of its development. But its germ lies in the purpose; the impetus toward

evolution comes from its innate law of development. From this may be deduced all requirements for works of architecture, which make themselves known in two directions. In most problems, we must satisfy material and esthetic purposes. What do these requirements comprise, that the building may suit its purpose most perfectly, and that it may take part in the improving and ennobling of life and in the welfare of man?

8. Suitability.

Fulfilment of Requirements for Space.

The material purpose is first expressed in suitability of the work. This comprises the space requirements of the problem, that the number and dimensions of the rooms may satisfy the conditions prescribed for the building by its purpose, that their order and arrangement may suit their uses, and that the entire structure shall accord with the customs and taste of the period. These elements of the problem influence the interior organism of the building. Its purpose and its rank among the creations to which it belongs are factors, according to which its organism and essentials are developed, and the magnitude of the building and the proportion of its parts are determined. On these will likewise depend whether all parts and rooms of the building fulfil their purposes, naturally diverse. According to their uses, the apartments in a building may be divided into two groups:--

1. Rooms for common use and for passage, more or less developed in all classes of buildings, and therefore treated in a general way in the last Section of this volume.

2. Rooms for special uses, which result from the purpose of the building, and which can only be treated in considering the different kinds of buildings.

The entire design must be organically developed from within outwards. This will occur and the building be appropriate, when each portion of the building and each room is in its proper place, when all conveniences are arranged suitably for use, in reference to each other, to the corridors and passages of the building, and to the entrances, vestibules and connecting halls, when the latter are distinct, clear, easily found, and arranged for convenient passage. The more important and imposing a room may be, the more prominent its place in the plan, and its place is to be indicated and emphasized on the exterior. The less important rooms will have to recede in the design for the order and unity of the whole, and will be sacrificed or subordinated to the more important and larger ones. Size and form primarily depend upon purpose, and secondly on esthetic considerations.

10. Building Site, Soil, and Surroundings.

With fulfilment of purpose is connected a proper choice and utilization of building site, as well as a consideration of local conditions. Not every site, nor every soil suits any building; it is important whether a building stands on a mountain or in a valley, in an open area or a narrow street, whether it is under the radiant sunshine or in the shady forest gloom. What would a Greek temple become in place of a Gothic cathedral? Why should an outlook tower be placed on the plain or a monument of victory on the market place? The palm does not grow where the oak thrives, nor the fir in the place graced by the laurel. As a plant thrives in a small unfavorable spot under proper treatment, receiving the necessary energy from circumstances favoring its development, so rises a well arranged building on a limited and unsuitable site, if the location and form of the site, the nature of the soil, and all other local conditions of the problem are fully utilized.

These points are likewise essential in the subdivision of a building, but also appear prominent externally, if the designer knows how to deduce from such restricting influences the idea of a work with characteristic treatment, adjusting the effect of masses of the building, proportions and dimensions of different parts, and the forms of members of the structure, to the site and its peculiarities. The same object will appear quite differently against the open horizon or clear sky, than before a dark background of deep green trees, the outline being more sharply prominent in the former case, the masses seeming reduced and the eye being more sensitive to slight defects in form, than in the latter case. We likewise know that the perspective image differs in height and depth and that we see things otherwise than they really are, the eye being subject to certain deceptions, to be neutralized by pleasing treatment of form. Observation of these phenomena led in the earliest times, especially in the best architectural periods, to a refinement and perfection of form, worthy of earnest study. In the creations of the present time, we apply the same laws, which the greatest masters of past art periods employed, and which we have recognized in their works.

11. Sanitary Requirements.

Creations in architecture are intended for the uses of life and for the exaltation of mankind. Their purpose requires that disturbing and injurious influences of climate and country, and that unfavorable conditions at the locality be remedied and in future controlled. These sanitary requirements first comprise measures for protecting the building from such influences. These are expressed in design and arrangement of

the building, in its location, and in precautions for protection from heat of summer and cold of winter, from sunshine and from darkness of night, from penetration of rain and shock of wind. We shelter ourselves from the elements by defenses against the weather, by arrangements for quick removal of rain water from the building to prevent dampness, and from injurious evaporation, by improving neglected grounds and preventing future uncleanness.

These precautions against external influences are also in the most intimate relation to the study of the building and the elements required for life, such as light and air, heat and water. They comprise those innumerable details in the plans of the building required by safety of the health of mankind, and which increase his physical and mental well-being. They do not belong exclusively to sanitary science, but especially to the problem of architecture. They make themselves felt in the sketch for a building, for sanitary requirements are not alone expressed in the elevation and internal arrangement of the house; they especially appear in general design and construction. If the entire organism be unhealthy, the evil cannot be removed by internal and limited means.

It is therefore first necessary to see that the building is placed on a healthy site, is built of good durable and weatherproof materials, and that it be properly orientated and sheltered from prevailing winds. Walls should be of such thickness, the roof so arranged and constructed, as to afford security against destructive effects of the elements. Drainage of the building and protection from dampness are required, walls and partitions must have openings for passage and free admission of light and air. The roof is a protection from rain and sun and should have such inclination and projection, and openings in external walls should be so protected, that rain water may be kept away from the building. In hot countries, one should be protected from dazzling light and scorching heat in lofty and airy rooms, shaded portions, in cold countries having rooms of less height, easily warmed, with closely fitted and cold resisting construction.

12. Requirement of Comfort.

These are primary requisites for a healthy building, and must appear in the plans. If to these be added provision for the well-being and convenience of man, for the pleasure and enjoyment of life, embodying the results of progressive science and technical skill, then is the material purpose of the problem completely fulfilled. Man's unremitting endeavor to improve his existence and for freedom from limiting external conditions is satisfied. In this is the nature of man's activity in civiliza-

tion, the aim of his endeavor and toil. To this ~~aim~~, ~~the~~ must correspond the building erected with regard and full knowledge thereof.

b. Durability.

12. Duration of Building.

Not only for the welfare of man must his work exhibit a sound structural organism, but it must have sufficient resistance to guarantee security against destruction by natural accidents, by time, and even by man. This is necessary for the building to fulfil its purpose satisfactorily. It must often be devised to endure for generations, for centuries, even for thousands of years, transmitted as a legacy to future ages, and useful to them. This gives another law for the creations of architecture, that of durability. Durability is also based on a requirement of feeling; for, in opposition to the transitory nature of earthly existence, it arouses a consciousness of duration, approximates the hopes innate in mankind, a desire for the unchangeable and the eternal.

14. Building Materials and Construction.

No detailed statement of what is understood by durability is required. This demands intelligent examination and choice of materials, both for endurance of weather, and resistance to accidental stresses. It consists in the proper use of materials in construction, in the formation of structural elements, and in the union of all parts of the structure in a properly formed building, treated in accordance with statical laws. As an essential factor materials and construction must be taken into consideration beforehand.

15. Magnitude.

Durability requires that magnitude for stability and resistance, which according to rules of science suffices for stresses, and in most cases surplus of strength to satisfy our instinctive feeling for security of the structure, against external influences and the effect of internal forces. Stability and Durability are therefore inseparable from the idea of magnitude. The structure must not only be actually stable, but must appear so; we wish primarily to see it in condition to permanently resist all destructive influences, and unconditionally durable. Greater strength and magnitude are therefore usually required, than are prescribed by statical calculations, and are necessary, when structures for permanent use are concerned; so much the more essential, when these are works of high importance and cost, creations of monumental architecture, which must possess these characteristics in a high degree.

16. Dimensions of Rooms.

This innate feeling is justified by experience, but has also been trans-

mitted by tradition. A brief review of the architecture of the past will convince us of this, as its monuments are most infallible evidence. They show how in earlier generations were influenced by this feeling and how they expressed it. They also exhibit another element of architectural composition, in the most intimate relation to magnitude, which is the dimensions of rooms, which may here be considered. We must make our conclusions evident by contrasting suitable typical buildings of the most important periods, noting those monuments only characteristic in respect to the questions discussed.

We first mention the pyramids of Egypt, whose sublime effect depends almost solely upon their dimensions and magnitude, though partly on the building material. We glance at their temples, which in addition to other architectural elements, especially astonish us by the apparently eternal duration of their great masses of building and by the simplicity of their construction and their majestic repose.

How entirely different does the Greek temple appear! Material and magnitude are most effectively employed and we also receive an impression of enduring strength; nothing unsafe or transitory is in the appearance of the skillful structure, enthroned above its surroundings in noble repose. But the mass of this monument is even in its least details the consistent result of a structural principle, carried out clearly and masterfully with full knowledge, the system of horizontal ceilings, which according to the law of gravity can exert only vertical pressures. The Greek temple is effective by its magnitude, much more so by clearness and truth of the creative idea, and by the beauty and perfection of its form.

How different again are the not less important masterpieces of Roman architecture! The less perfect form is intended for pomp and show, and construction is not brought to full and true expression. Architectural details borrowed from the Greeks were changed; supporting members are smaller, columns are more slender, and intercolumniations are wider. But another system of construction is capable of the highest development and appears repeatedly. The arch and solid concrete vaults determine the subdivision and the magnitudes of masses of the building; the structure in several stories is evolved. The element of magnitude appears with imposing and overpowering effect, and characterizes the mighty buildings of the Romans who did not avoid many sacrifices to produce this important element of architectural composition.

In the creations of mediæval architecture, especially in its highest bloom, the feeling for stability and magnitude is expressed in a very different way. The feeling for magnitude did not really exist. The struct-

ure is concentrated in strong and richly-treated wall piers and buttresses, with dimensions in accordance with the system of vaults; but with these are arranged thin enclosing walls and maximum area of window surface; over the splendid and spacious interior extends a vault, where arch rests upon arch, and rib upon rib to transmit the thrust to fixed points of support. But the entire system requires flying buttresses, arches, and structural parts to be stable; it is often highly ingenious and perfect in form, though not intended for eternal duration and immovable resistance, therefore has a somewhat disquieting effect, since mass is lacking. But the feeling for grandeur and longing for the infinite produces its mightiest and most ennobling effect in the loftiest monument for the worship of the Deity, the heaven-aspiring dome. This appears even larger and higher than it really is, by stone masonry in thin courses, by mysterious subdivision of surfaces and masses of the building, and the skilful treatment of the ornament.

We come to the architecture of the Renaissance and modern period, which may be treated together. For the same path has been pursued since the Reformation. Much that is grand and noble has been created, skillful science and high knowledge have been developed; but these art periodshave produced no really new system of construction, except iron and steel construction of recent period, based more on material than on system. Yet in this domain very important things have been accomplished in most recent years. The Engineer, produced by our ancient guilds, led the way in this direction by taking the principle of truth as his sole guide. Yet his science is still too young, and necessary time was not allowed him to devise beautiful forms for his works and thereby create with a useful science a beautiful art. We are in the midst of this movement and cannot anticipate it. But a present tendency concerns us, one towards the most rational and economical use of material and labor and minimum dimensions of the building, resulting from force of circumstances. We must take this into account, and cannot employ magnitude and grandeur to the extent permitted to artists in earlier periods of art, and must free ourselves from this desire, based only on tradition and not on nature of building material. We shall derive benefit from past masterpieces, but must not exchange intellectual freshness and susceptibility to present requirements, for the sublime and beautiful created in the past. And if Architecture primarily consists of results of experience and tradition for thousand of years, Science has a valid claim to joint possession, and must come to the aid of experience, and theory to the help of practice. Durability depends upon material, dimensions, and construction, and the general effect is in an intimate

23. relation to it. Both must suit the purpose and importance of the building.

Architectural composition puts these elements to varied uses; they characterize representations of the building, both of interior and exterior. An essential sign of durability or stability is direct and visible support, of all parts of the building by firm and resisting masses, avoiding all suspended portions of the structure, arranging supports beneath supports and openings above openings. How far our instinct to make supporting parts stronger and more massive than those supported, and lower openings smaller than upper ones may take this into account, must be left to other sections of this work. But it is certain disquiet oppresses us, when piers stand over openings, and heavy masses of walls load slender iron columns. These are endurable if the supporting system is clearly indicated and well defined, if the slender iron construction is inserted in the massive stone structure and arranged independently of stone forms. Late architecture thus produced very satisfactory works.

Under all circumstances, the use of a clear system of construction is essential. The simplest structures are naturally the most durable and pleasing even in our era, which has progressed so far in technical matters. Bold constructions require at certain points stronger supporting masses, even if they do not produce a feeling of insecurity. To effectively embody a system of construction opens a wide field of activity to architectural creation. This is in subdivision of masses, fixing dimensions according to statical laws for transmission of forces to walls and piers, as well as with a uniform distribution of pressure on foundations.

Parts exposed to external injuries must have greater dimensions than protected portions. According to purpose and importance of building, dimensions are to be limited to the minimum, or correspondingly increased. Strict utilitarian buildings and those for merely temporary purposes, are made as simple or as light as possible, and those intended for longer duration are to be strong and more durable. Mass and size are indispensable to monumental buildings, even if they do not alone suffice to make the structure an art work. They are expressed in details as well as in general. If the building is to have both a material and an ideal purpose, and is to be very durable, it should not be reduced to man and the brief life allotted to him. Its parts and the entire structure must be arranged on a larger scale.

Building material is to be selected accordingly, not only with reference to its resistance, but also for its massiveness, depending on its nature and origin. Wood is more exposed to rapid destruction, especially by fire, and must be considered a more perishable material than stone. Iron is

subject to rust, and we do not yet know its durability. Monoliths and ashlar of great size make an impression of resistance and eternal duration. Smaller stones cause parts composed of them to appear larger than in reality. In determining proportionate dimensions, the actual dimension is not to be confounded with the apparent size, produced by architectural members, subdivision and result of art.

Chapter 2. Truth and Order.

The preceding treats all requirements of the building to be directly deduced from its purpose, and thus connected with practical aims of life. But problems of architecture also comprise ideal aims, and these have been touched upon, since both are connected. The law of durability favors the transition; by the construction it belongs to the realm of science, and so far as based on instinct for magnitude and size, to the domain of art also.

a. Truth.

The entire province of knowledge and science is dominated by the idea of truth. For architecture requires truth in the fulfilment of purpose and truth in the expression of the construction. Both must be characterized in the shape, form and even in the least details of the structure. This means that truth must not be concealed, but must everywhere appear.

17. Sincerity in Fulfilment of Purpose.

This consists in the arrangement of the building and in the combination of its parts into an appropriate organism, and also in the characteristic form by which its importance is expressed. For truth appears in the character of the work; true originality depends thereon. Unfortunately in architecture, truth is usually under constraint, and both monotony and elaboration frequently manifest insincerity, indolence, and unfitness. It is without purpose and therefore untrue and faulty to arrange windows and doorways in misplaced order and symmetry on the exterior, where out of place in the interior, to project buttresses from walls with nothing to support, to employ columns and pilasters to support nothing or without meaning. Yet these are by many esteemed beautiful and essential! It is no less injudicious and false to treat the facade of a hall like that of a dwelling, to subdivide it into stories with several rows of windows, to give a block of small houses the appearance of a grand palatial structure, or to suppress division into stories as much as possible, permitting columns or pilasters to extend through several stories.

This does not condemn clear grouping of the masses in a block of buildings, where series of small residences receive united and effectual architectural treatment, each single house making itself evident, but blames

poverty of invention and monotony in architecture, long bare facades, where feeling is absorbed by visible absence of thought. Free scope is afforded to the imagination, so far as it does not degenerate in the grouping and subdivision, especially in extensive buildings. Thus in a mercantile building, where pomp and show are appropriate, it is entirely proper to combine two stories externally, internally connected as business offices, to secure larger windows for objects for exhibition, thereby serving the purpose of the building, at the same time expressing its intention.

We must adhere to this in architectural creations, and will attain this if we devote ourselves to truth and not to appearance, if we state that the window serves for light and the door for passage not for appearance, that the cornice is a protection from rain, and is not a decoration for the adorning of the interior, that the columns are supporting parts of the structure, and not merely ornamental like a decorative frieze; in brief, if we see that each part must fulfil a definite purpose and receive an appropriate form. We shall succeed if we arrange rooms in accordance with their purposes and importance, group less important ones, accent the chief apartments by projections, by greater height and by more noble forms. The great should not be minimized, and the small should not be made to appear great; unity must not be divided, and separate parts should not be united beneath a single roof. By such tokens is truth recognized in fulfilment of purpose. How is it expressed in construction?

18. Truth in Construction.

A characteristic of truth is that by the most diverse paths the same end is attained. If the same principle appears in the different methods of construction in architecture in preceding ages for giving form to its ideas, we recognize in it the principle of truth. We find in the best periods of architecture that the construction is expressed in its masterpieces equally with their purpose. If we sometimes meet with styles or structures where form is not in harmony with the construction, it is easy to distinguish the true from the false. We shall not take stone imitations of wooden structures in Asia Minor as models, but we must regard wise and consistent use of the material used and the system as characteristic, like the excellent systems of construction in Grecian, Roman, and Gothic architecture.

In Grecian architecture with its horizontal ceiling of stone beams, constructed of large blocks and slabs, statics assumes its simplest form in the law of gravity; rigid concrete vaults in Roman Architecture like inverted monoliths, exert no thrust; but we find in Gothic architecture generally a structure of ribbed vaults, transverse arches and arcades, com-

posed of small cut stones, where all individual stresses are equilibrated and individualized in the various parts of the construction, from which no single piece may be taken without injury. Whenever stone is used, joints and bonds are to be clearly shown, and where wood or iron is the material joints, connections, and system must be apparent. Just this makes the simple and peculiar wooden construction of mountainous regions so effective and so satisfactory. It is the same with much of our iron construction, satisfactory at the first glance in spite of its lightness; truth being expressed in the construction. Falsehood is a vice in mankind and a vice in art also.

We meet the same principle of truth everywhere, though methods differ with results to be obtained, means at our disposal, and obstacles to be surmounted. It also happens that in retaining this elementary principle, methods must be chosen according to circumstances, and these lead to results externally quite diverse. It is first to be understood, form and shape being devised later. The latter must be brought out clearly and truly, with an easily understood system of construction, which conceals or deforms nothing, but appears openly with dignity, lending to the structure life and importance, while treating the different parts in accordance with their functions.

19. Truth in Materials.

But the structural system is based on the materials. We do not describe how to build in stone, wood, or iron, nor how to determine dimensions and treat forms. Truth in construction must appear in a natural use of the building materials, which consists in having each material appear what it really is. Away with all peurile deceptions, where stone forms are imitated in wood, or metal, marble, and other costly materials are replaced by paper and paint! With false trifles and frippery, meaningless and therefore untrue! Yet rational use of a substitute material is not excluded, since even this by skill and treatment may be used in an appropriate way.

20. Degeneration.

Truth in art, as in life, may be carried too far. Great candor and sincerity frequently cause offence and are less appropriate than reticence. This is true in architecture also. Truth must not become oppressive or degenerate into rudeness and lead to exaggeration, opposed to the feeling for beauty.

b. Order.

The supreme general law in nature is order, and this is true in art and science. Research otherwise loses its starting point and the imagina-

tion is bewildered; truth and beauty are connected, and harmony is based upon it. It is therefore indispensable in art and belongs to the laws of architectural invention.

21. Symmetry and Balance.

The plan of the building may be symmetrical or unsymmetrical; order does not signify absolute similarity, but balance of masses of the building and of its members about a central point, or an axis through the centre of gravity of the design. Not strict mathematical symmetry but balance will be adopted as a guide in architectural composition. We do not undervalue symmetry or throw it aside; rightly understood, it is even more essential to order in art than in nature. Just as this never attains absolute sway over forms in nature, in the inorganic or organic world, we may not subject to it the creations of art without limitation. A crystal, leaf, flower, or fruit, exhibits two approximately symmetrical halves, but this is not true of the rock, twig, or tree. Even in more highly developed objects, especially in man, the completest work in nature, we find symmetry in the external form with reference to the axis of the head, but not in the internal organism. What is observed in nature may also be applied to art.

Therefore, the higher the rank assumed by the building, the more may we require order and symmetry, or similarity of its parts about a center, or a chief axis, and under some circumstances, of its side elevations about a transverse axis. The organism may show variations, especially in the interior; important portions of the entire structure, like the human body, may be symmetrically arranged without requiring perfect similarity. According to the importance of the building, location will be so chosen that its arrangement may not be restricted on either side. It is otherwise for buildings of lower rank, usually limited to a fixed site. Buildings for utilitarian purposes and those for the material requirements of life must be adapted in treatment to local conditions, like creations in the mineral and vegetable kingdoms, and symmetry is usually sacrificed to suitability and truth. The same occurs in buildings erected only on particular sites, to be harmonized with their surroundings. The different parts are then naturally arranged with reference to each other, according to location and purpose, freely grouped without restraint, or within a given space as if crystallized about a centre. One then seeks to symmetrically arrange each portion of a building like the separate crystals of a stone or the flowers of a plant, only so far as its purpose thereby suffers no injury.

The like occurs in the masterpieces of architecture. Very frequently

is the assertion made, that rigid symmetry rules in Grecian and Roman architecture, while in Gothic architecture only freely grouped and irregular designs occur. The first may be because only the monumental buildings of the Greeks are preserved, and the symmetrical arrangement is nobler and more suitable for these as already explained. Yet Greece transmitted to us in the Erechtheum a very characteristic and beautiful building, consisting of a triple structure, a double temple and a caryatid porch; neither part is symmetrically arranged about an axis, but in the general design and in accordance with local conditions, they are grouped with the utmost freedom and picturesqueness and are executed with the most refined artistic feeling. In reference to the second statement, we find that the principal monument of mediæval architecture, the Gothic cathedral, is usually symmetrically arranged about a central axis with a departure from legitimate symmetry in details only, in omission of annexes, towers, etc., on one side, where not necessary.

From this it follows that to require rigid symmetry in many designs for buildings, would be a fault, as it would frequently transgress laws of suitability and truth. This is the case in buildings with different parts varying according to their purpose and importance, in length and breadth, and in number and height of stories. How, if at a nobleman's seat or country house the principal salon were balanced by the kitchens, the conservatory was like the stables, and the chapel was similar to the chambers and living rooms, each of equal height and symmetrically treated, so that their uses could not be externally distinguished? This would be monstrous; not only monotonous in the extreme, but deceptive and false, whether intended to ennoble the building or reduce everything to a lower level. One is perhaps surprised by such contradictions and considers them impossible; similar things are actually found in many ^{palaces} places externally decorated by the orders, and are almost invariably regarded as proper and beautiful!

From these examples, easily increased in number, three things are evident: that especially in monumental buildings, symmetry may be omitted only for a definite reason; that when this occurs, one should not be discouraged thereby but should never for the sake of symmetry have recourse to absurdities like blind doors and windows; so far as possible, each separate part of the building should be symmetrical, whether the general arrangement be regular or irregular. But this must in all cases be natural; neither regularity nor irregularity may be artificial or compulsory, or degenerate into disorder and wildness.

22. Architectural Orders.

This means order in architecture, with which must not be confounded the

Architectural Orders. They were originally evolved in an organic way; from the Grecian temple the Order cannot be removed from the Greek temple, for its Order is its style. Just as little as may one of its members be omitted, as for an insect or a flower, without destroying it; in both cases each part fulfils a function assigned to it in the general organism and exhibits a form adapted thereto. But there is something else in the Order on a Roman building; it is merely decorative and may be removed and transferred at pleasure or be replaced by something different, as the construction of the building is not thereby changed. Since the revival of antique architecture has so proceeded, that without strict purism one may justly say that order has by the Orders become disorder, that these serve as falsities. They are only justifiable when columns or pillars have a statical function or at least a certain importance, and their existence is based upon the arrangement of the interior.

23. Unity.

In architectural design, order is shown in the arrangement of the building. We proceed from the inmost nucleus, from the heart of the plan, to develop the internal organism and to clothe the skeleton of the structure, to connect the parts, accenting the chief portions and making them prominent by form, subdivision and ornament. This method leads to the united organism and to unity in architecture. For in this way is made apparent the relation of architectural members, which separately possess no importance, and the unity of all parts, that one may not have a loose collection of accidentally joined parts, but an indivisible whole. Unity is based on order, but unity and harmony rule the realm of the beautiful, that innermost domain of art.

Chapter 3. Beauty and Ornament.

The idea of beauty is the highest law of architectural composition. In what directions must creation proceed to produce beauty? That belongs to each part, that the work of the architect may be beautiful? To answer these questions and fix the conception of beauty, we must again compare phenomena in nature to phenomena in art.

a. Beauty.

24. Conception of Beauty.

The idea in common life, when we speak of the beauty of a thing, varies according to the rank the object occupies in creation. We may indeed term any object created by nature beautiful in its way, since it is externally perfect; yet we justly call products of the inorganic and organic world beautiful, since they are distinguished above others of their kind, and the more fully one of these is endowed by nature, the higher is it placed,

and the greater are our requirements. Thus the crystal by its simple and regular form, by color, lustre, and behavior toward light, and the flower by its form, by the magnificence and blending of color tones, by its fragrance, and even by its organic life, produce animated and pleasant impressions. If we take the higher forms of nature, or the highest product of creation for comparison, we find perfect beauty in mankind, not only the highest example of completeness in external appearance, but the impress of his spirit, the expression of his spiritual peculiarities, and above all, we find character. A head possessing character will always prove beautiful; but a fine head is not always evidence of a noble character. Possessing the latter, one will be guided by ideas of morality and truth in all situations in life, and both are combined in the idea of beauty.

25. Architectural Style.

As with phenomena in life, so with phenomena in art; but as character is to man's life, so is style to the domain of art. Style is just as essential to beauty in art, as character to beauty in life. For style is the imprint of art processes by which creation takes form in accordance with the nature of the material treated and with the ideas of the time; or, as expressed in Semper's words; "Style is the harmonizing of art phenomena with the history of its origin, and with all the requirements and the circumstances of its existence".

Let us hear the same master in regard to the origin of architectural styles: "The ancient monuments are rightly designated as fossil shells of vanished social organisms; but they did not grow on the backs of these while they existed; nor did they shoot forth in the hidden processes of nature like coral reefs, but they are constrained works of man, who has employed on them his understanding, observation of nature, genius, will, desires, and powers. The free will of the creative spirit of mankind therefore enters as the most important factor into the question of the origin of architectural style, and this must indeed in his creations move within certain higher laws of tradition, of requirements, and of necessity, but it adopts this by its fine perception and realization and makes it useful. Wherever a new idea of civilization took root and was accepted as such in the general consciousness, this found architecture at its service to determine its monumental expression. Its mighty civilizing influence is always recognized, and its works were with assured purpose impressed with that stamp, which elevated them as symbols of the prevailing religious, social and political systems. Not from the architects, but rather from great regenerators of society proceeded this new impulse, when the right hour had sounded for this".

A new architectural style is only produced by a new view of the world, the gift of a new epoch of civilization, whose world-moving idea may even be nature. Since we are on the ground created by the acquisitions of the Renaissance, we enter completely into the inheritance of that great period, when we truly make it our own, both in science as well as art, by developing it in accordance with requirements and conditions of modern civilized life. From this will the true and beautiful architectural style of our time be derived. It also follows that all our thought must be directed to spontaneous architectural creation, and all our abilities be exerted, to contribute our own work for this high purpose. The power of the architectural profession does not suffice, while the energy and will of individuals are lacking. But scattered labor is most injurious, and it is a delusion to believe that decoration by the old can equal the invention of new ideas, or that periods without styles may be revived.

Architectural style requires a clear system of construction by our statements and all traditions. Yet this does not itself form a style although an important element. The same structural principle may be developed in different directions and form the bases of different styles. The present does not need to await an epoch-making invention of a new system of construction, as if creation of a new style were dependent thereon. Other impulses are explained in Semper's words and actually produce it. Like other elements of architecture, style depends on the building material. One may properly speak of a wooden style, a brick style, an iron style, etc., because in each of these the respective building material is indicated, since the style assumes a special character in accordance with it.

26. Building Material.

The building material is itself an effective element of beauty by the characteristics of its external appearance. Granite and syenite, by indestructibility of their nature, color and polish, cannot be replaced in monumental architecture by other materials, any more than marble, with the delicacy of its tones, its veining and its texture. Sandstone is distinguished by its dull tone, appropriate for external architecture; clay is notable for plasticity and suitability for all purposes, in plain bricks in masonry and in terra cotta and majolica for relief and color decoration. Wood has an excellent effect as internal finish by diversity of grain and color, by its capacity for polish, and by suitability for carving. Iron assumes in the mould and under the hammer the most varied artistic forms; bronze takes the highest development in form under the tool of the chaser, one not obtained in any other material, and acquires a beautiful patina, surprising in antique bronzes. Finally should be mentioned stucco as and

be beautiful and may appear ugly in connection with another, the converse being also true. It is quite the same as in music. One tone is in itself no more beautiful than any other; its full effect only appears when joined with others in chords, melodies and musical works. Rhythm and harmony are also required in architecture; as in musical or color tones, a form is only effective by combination or contrast with others. The use of successive novel forms has a disquieting and bewildering effect, while repetition of similar motives in rhythmical sequence is quiet and animating; though if these too frequently occur, they become exhausting and monotonous.

29. Subdivision.

This is true of formal treatment in general and in detail, the subdivision of the form, by which its beauty is increased or diminished. Subdivision must be arranged in accordance with the character of the building; simple or rich, graceful or severe, grave or gay, according to the purpose of the structure and to other circumstances. To heighten the effect, the animated and subdivided portions must be relieved by plain and undivided surfaces, a certain accenting must be employed with a certain rhythm of lines, that the correct relation between masses and openings may be retained. Harmony is again required; it is the feeling of solidity, durability, and order that fixes the requirements to which due attention must be paid in subdivision.

The treatment of the members in detail will thus be subordinated to the general subdivision, and is to be adjusted in accordance with the character of the building. This extends to the forms of structural parts of the constructive organism, and makes apparent the structural importance of the parts of the building. We cannot here neglect characteristic art forms determined by the architectural style. The necessity for resisting the same external influences and the same internal forces, and the requirement of making this conflict apparent to the eye, has produced similar lines and forms in the most diverse periods and localities. As we make known our thoughts by tones and words, so do we in architecture express our designs in lines and forms. We therefore take these forms from those originated by innate feelings of mankind, that they may be apparent and be understood in the simplest and most natural way. We can also consider, with slight exceptions, that these are just as much fixed as are forms based on the laws of nature.

30. Mouldings and Profiles.

Such forms are mouldings and such lines are profiles. They are partly composed of geometrical lines and are partly free hand. We do not designate these architectural members according to their functions. They may represent transmission of a load, a free termination, or union or separa-

tion of structural parts, and curves of varied curvature, convex and concave, some bold and heavy, others delicate and graceful, alternate with angular and straight forms; the more closely these lines approximate straight lines, the more energetic should be their sweep, and beauty of form is based on well arranged graduation, on change of movement, and on the effect of light and shade.

31. Scale.

Subdivision in general and in detail is to be designed on a single scale, not based on an absolute, but a relative unit of measure, which depends on the purpose and importance of the building. Thus we properly speak of the scale of a building, and where this does not exist, of the lack of a uniform scale. Harmony occurs in Grecian architecture instead of a scale, or not quite symmetry, but harmony of the whole with its separate parts, which appears in the nearly identical ratios of the lower diameter of the column to the building, to its principal parts, and to the architectural members. The modulus replaces the scale, for it has no relations to the dimensions of the monument. Whether the temple be small or large, its proportions remain about the same, and as actually fixed by artistic invention and not by the object itself. But for the vast monuments of the Romans and especially for the creations of the middle ages, as well as for those of the Renaissance and the modern era, a fixed scale is taken as a basis, which first depends on the height of man, afterwards on the building materials. It is indeed natural to assume this scale, all our buildings being used by men, since windows, doors, balustrades, etc., are in proportion to their height, dimensions being only varied, according to whether intended for merely useful structures or those occupying higher rank and intended for assemblage of many persons.

It is just as erroneous to enlarge the architectural forms of houses and of ordinary buildings to unusual size, as to diminish those of monuments intended for extraordinary purposes, like triumphal arches, baths and theatres. If this be done, the scale and general effect of the building are changed; for it will appear smaller, the larger its scale in proportion to its absolute dimensions, and conversely. To make this evident, compare Cologne Cathedral with the Church of St. Peter at Rome. Who would believe that the latter was two and a half times the area of the former? This may be explained by magnitude of scale and of dimensions; There a narrow five-aisled interior and heaven-aspiring towers are lost in graceful details, suited to the stature of man; here is a spacious interior, decorated by colossal statues, spanned by mighty tunnel vaults with a gigantic dome over the intersection, beneath which men vanish. The Church of St. Peter indeed excels in grandeur

of effect of space, but the Cathedral of Cologne excels in spacious effect of the masses.

32. Proportions.

The greatest influence upon beauty of form and effect of the masses is exerted by these proportions in architecture. They mean the relations of the whole to its separate parts, based on a harmonic system, and they are in intimate connection with the subdivision and the scale, and therefore cannot be transferred to any other object and scale. The Church of St. Peter shows that the proportions may be in themselves correct, but may be relatively faulty. Nature shows this, when it varies the proportions of the human body in accordance with age and sex, the proportions of the head, hand, and foot to the body differ in men from boys, and in women from girls.

Therefore if the proportions of a building may not be arranged in accordance with a rule fixed for all classes, but must be selected according to circumstances, one must not yield to a delusion that they are only determined by our feeling. Sense of proportion is variously developed in men; the eye must be trained to discover defects, just as the ear finds discords. The architecture of past periods supplies us with the means in numerous monuments with model proportions. From their study, we find the proportions of a building to consist of harmonic relations between masses and openings, between flat surfaces and reliefs, and between length, breadth, and height of mass of the structure. These ratios may be expressed in numerical values or in geometrical figures, which afford most valuable data. But we cannot include in the calculation and the drawing the influence of the site, or of the scale and color of the object upon its proportions, and this influence ~~is~~ ~~is~~ ~~is~~ is very important. We must not lose the chief points of view for the problem, or a regard for the harmony of the whole. What would become of art, and what would talent do, if beauty of form could be deduced by formulae? These enable us to subdivide masses and interiors of ungraceful proportions in such a manner that the object may appear removed or lessened, and division of the structure or union of its parts may induce beautiful proportions in detail and a harmonious general effect. These indications require explanation, But the evidence, other connected deductions, and discussion of optical effects, must be left to a later part of this volume.

b. Ornament in Form and Color.

Ornament in relief and in color are other elements of architectural composition. These contribute much to the beauty of the building, which might in itself be beautiful without ornament, since it could not attain true beauty with ornament alone.

33. Origin of Decoration in Relief and Color.

Inclination for ornament springs from an innate impulse in men to beautify their existence. Men in the ~~A~~ lowest stage of civilization adorn their persons and the work of their hands. From occasional festal decorations of important buildings, originally consisting of natural flowers and fruits, of ornamental vases and trophies, opening later a permanent ornamentation by the aid of art; it became a requirement of art. Imitation of nature produced artificial ornament, either relief ornament in clay, stone, or wood, or applied as colored ornament with brush and color. The elements of relief and painted decoration are in the creations of nature. But it would be an aberration of art to seek to produce an accurate imitation of nature. Each art period has therefore taken nature in its own way, and has sought in representing it by form and color to bring out the ideas of its time in characteristic expression.

34. Ornament.

Ornament undoubtedly belongs to the domain of architecture and is indispensable to its works, preferably obtaining its motives from the vegetable kingdom, though also from the animal kingdom. It is incised in the surface as linear ornament, though this is chiefly executed in color, or is carved as relief decoration in the building material itself, and it is imitated from living forms of nature with more or less freedom. Conventionalization is absolutely essential. For decoration must not sink to a slavish imitation of nature; we must know how to apply it, to modify its type in accordance with the material, to simplify and to conventionalize it. Naturalistic treatment will be less suitable, when the ornament is required to express the character of a quiet surface by a pattern or a strong rhythm. We therefore distinguish between free decorative ornament and structural decoration, the first being purely ornamental, the second expressing the construction. Decorative ornament is a free addition produced by the spontaneous feeling of mankind, whose origin was just described. It contributes to the beauty of the object by animating and decorating plain surfaces and stiff members judiciously, but is not absolutely necessary. Structural ornament proceeds from a less primitive desire of mankind, expressed by making prominent and by adorning the form of the structural part as determined by the style. It therefore extends to the actual members of the architectural organism especially to those, like the shaft of a column, a console, etc., where the conflict of different stresses in the structural system becomes apparent.

Ornament in general, especially free ornament, should in accordance with its origin always personify an idea related to the ideal significance of the building and taken from the phenomena of life and nature. Motives from plants do not suffice; animals must in part supply motives; man himself and

his forms appear in the creative realm of the artistic imagination; animal forms are even invented, formed in accordance with the rules of decoration, but which must have a justification of their existence in an apparent capacity for life. Thoughtful ornament, composed in such a manner, ennobles and animates the work; it affords food for thought; one would not become tired of it, while meaningless ornamentation, even if equally beautiful, would soon become wearisome. It is not said that everything should be covered by allegorical ornament; the more important and effective ^{this} is, the more sparingly it is to be applied. Simple rhythmic patterns are appropriate for animating the surface, as well as geometrical frets and bands to enclose it.

Structural ornament contributes to the decoration of architectural members; it has no statical function, but adjusts and lessens the conflict of stresses in architectural members. It should not conceal the leading forms, but allow them to appear in their structural significance, and lend them life and movement. Stone forms naturally prevail here. The formal treatment of every kind of ornament is entirely dependent on material and technical processes.

35. Color.

The influence of color upon architecture must also be considered, even if it be merely accessory, since it is of great importance to the effect of form. It is indeed one of the most effective and most prized elements of architectural composition, both for accenting form in the best manner and for carrying out an independent creative idea. The use of colored decoration on the pictorial imitation of an object is perfectly natural, since color appears in everything in nature, and in building materials form and color can not be separated. Its introduction is therefore justified in the representation of objects from nature and from life. This is true in reference to architecture also, since all architectural styles ^{have} ~~may~~ obtained a polychromatic effect, partly by materials of different colors, partly by color decoration. Although external polychromy may have been largely employed only by certain nations, yet wider scope has always been accorded to it in the interiors of buildings.

36. Polychromy.

First consider the use of color in the interior, which esthetic feeling has always required. A hall, or even an important room of a building is incomplete while uncolored; color is therefore indispensable to internal architecture; nothing opposes its free development, and the modern period therefore properly makes a most extended use of it. What chiefly concerns the color treatment of the building? How is harmonious effect to be obtained? This requires a developed feeling for color and an earnest study of the polychro-

matic masterpieces of architecture; suggestions are to be taken from nature, to penetrate into the mystery of its splendor of color in the organic and inorganic world, and to derive useful applications from them. We learn that upon contrasts of colors and broken tones, upon those of primary and mixed colors, is based the harmony of colors, and if we investigate the phenomena of nature, we find primary colors prevailing in ordinary natural phenomena and in low forms, but mixed colors in higher forms.

But nature also gives us by a moderate use of its color materials a suggestion for the use of color in architecture. We conclude that a tone derives its value from its surroundings, that pure colors become quiet and harmonious with a broken ground tone, strong and brilliant with light and shade, and that mixed colors alone are monotonous and without light. We note that the latter remove the object further from the eye, the former causing it to appear nearer. These are especially applicable to use of color in the interior, but it is otherwise with the polychromatic treatment of the external architecture. It is not in the power of the creative artists to exclude all elements, that may produce discord and injure the desired effect. For this depends upon external influences, on sky and sunlight, and on surroundings. A colored facade is like a festal garment, and the building makes a peculiar impression, as a separate decorated object, especially in rain and snow. If harmony, the primary requirement of beauty, occurs, the surroundings must be suited to the key-tone, and at least to a certain extent, polychromy must be applied to the external architecture. When this is done, wise moderation must be exercised, more than in using color in the interior.

For the polychromatic treatment of the exterior, as well as of the interior of the building, we have the means in natural and artificial building materials of varied colors, and especially in the greatly developed technical processes of the decorative arts. The principal building material or the local color will give the key-tone of the harmony; the chief member will be kept in a quiet and united tone, while stronger colors are permissible for other parts. Veined materials of varied colors are effective and suitable for small enclosed surfaces, flat architectural members, unfluted shafts, etc.; but when employed freely and as subdivisions, they frequently have an unquiet and disturbing effect. Light tones may be used above and dark ones below, especially in the interior, where persons and objects become more prominent before a dark background. For internal color treatment and an especially effective element in very recent years, is stained glass also properly employed

in secular architecture. In no method of coloring are colors more splendid, more beautiful, and more harmonious for interiors. Color is in both nature and art so costly that we fully enjoy its recent advancement among us, and only wish it to completely supplant the dull gray of the last decade, and that a feeling for color may more strongly affect mankind.

37. Painting and Sculpture.:

Ornament and color justly belong to architecture by their origin and by use for thousands of years. It also claims the assistance of painting and sculpture, which are suited to impart to its works the highest importance. No monumental building is complete, or can be finished, without these accessories. An indication of high development of art and of the work of a master in all periods, is the assignment to creations of the sister arts the place of honor in buildings. How should architectural composition proceed? How should painting and sculpture in the service of architecture treat their works? These questions suggest further study. We merely indicate the direction from which their answers may be expected.

The architectural work is to be so designed, that it may remain without painting and sculpture, complete and beautiful in itself. It is to be decided as if paintings and sculptures did not exist, or were removed from the places assigned them by the master. He places them in the tympanum, in the frieze, in panels, and in niches, to impart to his work grace and beauty of life by living representations of the beautiful. But the works of the painter and the sculptor must be subordinated to those of the architect; they must not disturb unity and harmony, nor monumental repose of the building, and must be suited to the spaces created for them. Sculptures and paintings must correspond to the intellectual purpose of the building, conform to it in style and scale, and be in complete harmony with it in drawing, relief and color. Thus have the three formative arts wrought together in all ages, contributing to the master works of architecture. Nor will our era fail in this, either in ability or desire.

FINAL CONSIDERATIONS.

38. Application of Preceding Laws.

We have here followed theory; we have seen the tree of knowledge arise from a germ, grow by the impelling force of truth, and blossom under the power of beauty; by its law, we ascribe to the creations of architecture the highest consecration and perfection of art. How is it with the restrictions and the applications of these laws? These are the same

inviolable laws, valid in past great art periods and retained in all ages. They are known, but are also misunderstood. This especially occurs for the principal of truth. It is most commonly opposed in art, exactly as in life. For endeavor to appear otherwise than he is, is founded in the nature of man. Hence appropriateness and even true beauty commonly suffers, not alone in works of special importance. Tendency to deception is the vice of our era, and is deeply rooted; it has penetrated even into the home; we are pleased to deceive ourselves there. Is it not generally stated as a special merit, that stucco appears to be wood, and wood looks like marble, that a principal cornice, a roof, or an ornament is so made of zinc as to appear exactly like solid stone? And all this is due to the art and brush of the painter!

39. Recent Period.

But error appears in even another direction. The time is not distant, when the perfection of architecture was thought to be the most faithful imitation of an antique building. Structures were copied, whose originals were built many centuries since under another sky, of different materials, for other purposes, and at another scale. What was the result? A so-called architectural style in accordance with the supreme law, which must consist of all possible architectural styles, that the entire history of civilization might be reflected therein, just as our modern civilization is composed of the elements of all earlier civilizations.

40. The Present.

This age has indeed some good points for it has led to more accurate knowledge. It is now generally understood, that however great he may be, one man cannot create a style. It may be a different and better one, but is still not good. One no longer copies, but composes, though in the most different styles. Architecture is believed to advance, when the style is modified in accordance with fashion. Yesterday Greek or Roman was used, now it is German Renaissance or Barocco, and it will tomorrow be Romanesque or Gothic; Louis XV and perhaps Japanese must be found side by side in the same series of apartments. Whither will this lead in a rapidly living age? Architecture has become merchandise; and adjusts itself to supply and demand. Nearly all styles are now offered; a bit is cut off from this style, one from that one, all drawn from one source under the pressure of fashion! What all earlier ages possessed, which we do not miss in the Rococo, has been lost; unity of

style is lacking. The building is a creation of the age and therefore exhibits the attire of the period.

41. The Future.

What will result from this confusion of style? How is it to be improved, and how may the taste of our era be guided in the right path? Only by holding firmly the unchangeable principles of our ancient art. But all may be truly beautiful and correct in theory, yet by practicing it one can not live. With the best principles one may suffer hunger, for the truth alone does not lead to abundance. Nothing can be opposed to the truth of this argument, so long as owners and the public only desire deception. The remedy is the teaching of better ideas, and by guidance to the straight, though toilsome path of the good, the Beautiful and the True. Who shall transform public conception of the needs of art, other than the artist? What have we done for this? We have complained, suffered, and blamed ourselves and others. We must turn about, for we waste instead of utilizing the power of past art periods; we yield and embrace eclecticism, as it is more convenient to go with the current than swim against it. But we have lost original and spontaneous creation. To acquire facility again, we must commence the work with ourselves. For "Fine art", says Fergusson, "is a hard task-mistress, and to obtain her rewards, men must work, and think, and exercise infinite self-control. False art is an easy, smiling dame, whose favors are readily dispensed, but worthless when obtained". We will lay hand to the work, at the same time speaking for light and truth! Even if the individual cannot do much, the entire profession may accomplish something, a generation so much the more, and that begun today may be continued tomorrow. We hope for success, as a visible improvement and a purification of art already occurs. All conditions exist for art in fresh bloom, shining forth in the clear sunshine of a new era of beauty. The feeling for architecture has become more active, even if it has sometimes wandered from the path. The public takes a living part in its development; the architectural profession has sacrifice and inspiration and is distinguished by genuine knowledge and skill; artisans are full of energy, ability, and a wide knowledge of all expedients; we command more money than ever before, and better transportation, bringing us near the most distant countries, and while united, ought we to fail in producing art peculiar to our era, escaping from the domain of eclecticism and of fashion? But it is first necessary that the prevailing misconception of what is good or bad, true or false, beautiful or ugly, should end. And with this aim, we will hold fast our grand principles of arch-

tectural composition.

DIVISION II. PROPORTIONS IN ARCHITECTURE.

By Professor August Theirsch.

42. General.

Laws in architecture assure the beauty of the edifice, just as this is lessened by neglecting them. To seek and to formulate these principles is a problem that science cannot neglect. We endeavor to find and justify its solution, the direct result of esthetic feeling. As for proportion, it is certain and beyond all dispute, that parts of a building must bear a proper relation to each other and to the whole. How may this relation be stated, can it be expressed by numbers, or referred to simple geometrical figures?

Relations of harmonious tones in music have been definitely arranged in numbers. Different tones have different numbers of vibrations. Tones harmonize when their vibrations coincide or accord. Physicists have discovered a similarity in the effect of colors on the eye. But to deduce from this that the eye prefers certain simple ratios of magnitudes in proportions and forms is an error, upon which numerous theories have already been wrecked. For if two tones harmonize together and one be then slightly raised or lowered, the drum of the ear is set into complex or irregular vibrations, producing a discord. But if a rectangle has its sides in proportion of 2 to 3, and its length be then slightly changed, the eye cannot perceive the change. Simple numerical ratios certainly participate in the proportions of ancient edifices. Much talent and labor have been expended in fruitless attempts to discover simple numerical ratios to serve as a basis of the three dimensions in space of an architectural structure. Only a few points can be given here. Henszelmann came to the conclusion that harmony of proportions in the architectural monuments of antiquity were neither result of artistic genius nor merely accidental. He believed that he found the secret of the ancient architects in the use of the ratio of the side to diagonal of a square, and that of side to diagonal of a cube, and with these magnitudes constructed a scale, for all dimensions of a building. Viollet-le-Duc believed that ancient architects employed three different triangles as bases of proportions; the Egyptian triangle (of the Pyramids), the right angled with equal angles, and the equilateral. But the manner in which these figures are combined on the Arch of Titus at Rome and on the section of the Cathedral at Amiens is not convincing.

We may say that these elements do not hold good so far. If the law

of beauty exists in them, architecture would be condemned to monotony. The massive and bold is justified as well as the slender and graceful. Different characters have each their peculiar beauty in nature, as in this. We seek a law tolerating variety of forms and maintaining itself under the most diverse conditions.

43. Similarity of Figures.

A step toward the discovery of such a law was taken when Zeising treated of the golden mean, the fixed ratio that Euclid taught, when the smaller portion of a straight line has to the larger the same ratio as of that to the whole. Its application to architecture is defective, since the relative proportions have no intelligible relations to each other. But we will accept the idea and proceed further. The fixed ratio is general, as well as similarity of figures. By study of the most successful works in all periods, we find a basal form repeated in each edifice, and that different parts always form figures similar to each other in arrangement and form. Innumerable different figures or simple forms of masses may in themselves be termed neither beautiful nor ugly; combined arrangements are alone beautiful. Harmony first arises from repetition of the primary form of the structure in its sub-divisions. This intimate relation of individual members to the whole is especially observed in works of classic architecture and on it is based their united and harmonious appearance.

Chapter 1. Proportions in Doric Architecture.

44. The Doric Temple.

If this be true, it must appear most clearly in Doric temples, whose proportions were employed unchanged for a century. Such complete harmony of all parts was not produced elsewhere than in the columnar construction of the Grecian Doric temple. Fixed ratios were not established, but from the oldest heavy monuments at Selinus to the elegant marble temples in Attica, with firm adherence to the general arrangement and the details, we find a variation in proportions, at the first view a defect. The ratio of length to breadth of the temple, of diameter of column to its height, of height of entablature to height of column, etc., continually vary, but with few exceptions nearly every building retains harmony in its parts, presenting a harmonious effect, complete in itself. Two peculiarities are found: 1, very simple numerical ratios are used for certain parts of the building, later disappearing in artistic temple architecture and giving place to complex ratios; 2, similarity of geometrical forms of all analogous parts, which is retained as a leading idea until later antiquity.

45. Numerical Ratios.

The following simple numerical ratios are retained in the ancient temples.

Width and height of the cell are equal, as well as those of the pronaos.

2. Width and height of the facade of the cell, so far as externally visible, are to each other as 3 to 2. (Figs. 1,2,7)

3. Height of the columns equals twice the distance between their axes ($h = 2a$)

4. Height of the architrave equals one-third the distance between axes of columns, or of length of architrave blocks.

The first requirement is satisfied when height of the pronaos to the top of architrave, or to ceiling beams, equals distance between the antae or walls. (Figs. 2,5). An intention is evident to strictly retain ratio of height to width of cell of the temple in the colonnade of the facade. The four middle columns are so placed before the cell that the outer axes coincide with the external width of the cell. (Figs. 2,4,7, 9,10). With the entablature above it, this portion of the columnar facade always forms a rectangle, closely approximating to a square, Semper's unit; which = $\frac{\text{Height of column with entablature.}}{\text{Three times distance between axes.}}$

Since architrave and frieze are usually equal in height, it results from 3d and 4th requirements that height of the entablature, omitting the geison, is one-third height of the column. The rude temple at Selinus by partially fulfils these requirements. (According to Pliny, the height of the column was at first one-third the width of the temple). The following monuments retain these numerical ratios. Temple A at Selinus; Temple of Poseidon at Paestum; Temple of Zeus at Olympia; Temple of Athene on Egina.

These numerical ratios recommended themselves for practical reasons; they made the designing and execution easier, and were perhaps prescribed by the priests. They could not form a rule for all cases and all periods.

When architecture assumed a bolder flight and freed itself from ancient priestly restrictions, men first abandoned the limit of height of the columns and made this greater, so that the column without its abacus, or its shaft alone, attained a height $h = 2a$. The architrave block firmly retained till later the ratio of 1 to 2. The entablature thereby became lower in proportion to the column. But the other law remained in force, that the parts of the building should be similar to each other and to the whole. This harmony comprises 1, the similar forms of the two principal parts, the enclosure and the nucleus, or the peristyle and the cell; 2, the repetition of the same forms and proportions in the parts of the build-

ing.

46. Ground Plan.

1. With all diversities in length and breadth, comparison of the plans shows an intention to give the outer line of the peristyle (edge of upper step) the same form as that of the interior of the cell. (Figs. 3, 15). Porticos are very deep before and behind the cell, but are very narrow along its sides, an arrangement not explained on structural or practical grounds. If the diagonal of the rectangle of edge of upper step be drawn, it either coincides with the diagonal of interior of the cell, or is parallel to it. With few exceptions, this is true for the plans of all Doric temples, even for the little archaic temple-cell on the Acropolis at Selinus.

47. ~~Entablatures~~ Facades of Cell and of Temple.

2. The facade of the cell, so far as visible, or to bottom of inner architrave, and the facade of the entire temple with its stylobate, form two similar rectangles (with the ratio of 2 to 3 in the archaic style); the cell and its peristyle have similar forms. (Fig. 4). To produce this conformity, high entablatures and stylobates are necessary in case of temples with a wide space between colonnade and cell, lower entablatures being required for temples with narrow porticos. (Figs. 6, 7, 8). This also explains why external entablatures are frequently lower (Fig. 9) paestum, or often higher (Fig. 10) Bassae than the internal one. In other words, the peristyle adds to the cell proportionately as much in height as in breadth.

48. Entablatures.

3. Each pair of triglyphs enclose a metope and form with the portion of cornice above them a combination, in several ways exhibiting a similarity to the entire building, viewed from front. As the cell-walls and columns along the sides inclose a darkened vestibule (pronaos), so do triglyphs in the frieze inclose the metopes. These appear like small spaces beneath the protection of the widely projecting roof, and they are open in front and filled with sculpture, like the pronaos of the cell. A closer observation shows that the two likewise coincide in the ratios of their magnitudes. The form of the metope varies similarly from a square, as does the opening of the pronaos. (Figs. 9, 10). The width of the triglyph also bears the same ratio to width of metope, as that of width of portico, including columns and walls to width of pronaos (measured between antae). Simple numerical ratios are most common:

Temple C at Selinus, 1 to 1.

Temple of Poseidon at Paestum, 3 to 4.

Temple of Concordia at Agrigentum, 2 to 3.

Temple of Athene on Egina, 3 to 5.

Temple of Apollo at Bassae, 3 to 5.

Narrow cells therefore require narrow metopes, and wide porticos demand broad triglyphs.

The band at the top of the metopes is also analgous to the internal architrave, while the projecting mutules correspond to the ceiling of the vestibule. A comparison shows that the mutules, taken with the two bands beneath them, actually have the same ratio to the metope, as the entablature to the cell. (Figs. 9, 10). These portions of the entablature and the taenia with its regula were always marked by their deep color as belonging together. They repeated the form of the entire building on a small scale.

Further, the geison is to the triglyph-frieze just as the entire entablature is to the cell-walls and to the columns. Indeed, the height of projecting cornice almost invariably has the same proportion to height of the frieze (including mutules with frieze), as height of the entablature has to height of the column. Compare corresponding profiles from Paestum, Egina, and the Parthenon. (Figs. 11, 12, 13). Thus the principal ratios between stylobate, column, and entablature, are repeated in the larger and smaller subdivisions of the entablature.

But a relation between the smaller and larger parts is carried out in the projections, with especial reference to outline. The portion of the abacus projecting beyond the shaft of the column likewise forms a rectangular projection similar to that of the geison, taking a diagonal view of angle column. The profiles of capitals represented in Figs. 11 and 12 are to be considered as diagonal sections projected on the facade of the temple. The entire entablature, so far as it projects sidewise beyond the body of the cell, and the geison, as well as the drip-moulding, form projecting and similar figures. (Figs. 11, 12). The extended diagonals of the facade of the cell usually pass through the angles of these figures, thereby fixing the ratio of their breadth and height.

49. Elevation of Entablature.

4. On the elevation of the entablature exist the following harmonies between horizontal figures. The two architrave-blocks abutting over a column form a surface 3 times longer than high, according to an archaic rule. (Fig. 14). A similar rectangle always appears in the abacus of the capital supporting these blocks; a similar figure is also formed by the entire entablature of the facade, and it appears again in the graceful regula and guttae, which are a reduced representation of the entablature of the facade, with its six conical supports.

The form of the cornice block, if its height be one-half the height of the architrave, which is true as a rule, is the same (1 to 2), and also as the form of the triglyph-cap. Thus, ^{on} the facade of the Doric Temple, this relation is carried out in the most minute detail and is intimately connected with the number six of the columns (on facade).

50. The Parthenon.

Only an architect of genius like Iktinus dared permit himself to depart from traditional arrangement, when he assigned eight columns to the facade of the Parthenon. He thereby abandoned the harmony of cell and metope, as well as that of architrave-block and entire entablature, but thus obtained perfect harmony between the interior and the exterior of the temple, that had never occurred in the hexastyle plan. The plan (Fig. 15) shows how the inner area of cell included between columns, harmonizes with entire interior enclosed by walls, just as this is again similar to external outline of the cell, and lastly to the outer colonnade. It was thus possible to obtain harmony between cell and peristyle in all parts of the edifice. (Fig. 13). It occurs here, both with and without stylobate, in the last case taking architrave of the inner colonnade together with height of the cell. The facades of cell and of entire structure here form rectangles of 1 to 2 instead of 2 to 3.

Of other relations, the following are retained: ratio of height and projection of cornice to height of frieze, as well as of height and projection of entire entablature (beyond side walls of cell) to height of columns. (Fig. 12). This figure gives projection of drip-moulding, and that of abacus of capital viewed diagonally.

On the entablature of the Propyleum, otherwise very similar to the Parthenon, the geison projects considerably more, corresponding to the great depth of the portico.

51. Later Buildings.

The architect of the Parthenon followed the hexastyle arrangement in the construction of the Temple of Apollo at Bassae, but the expression of boldness was varied still more than the case heretofore in buildings in Attica. The character of the edifice is determined by form and proportion of the column. This is the only living element in the stiff construction of the structure. The diameter and diminution of the shaft, the profile and projection of the echinus again vary in each temple, according to the taste of the architect and the prevailing acceptations of the period. In the archaic temple, the strongly diminished shaft and fleshy, widely projecting echinus express a high degree of energy, that the column exerts against the load of the entablature. When the columns later

became higher and the entablature was proportionally lower and lighter, men were satisfied with moderate display of force by a stumpy and lean form of capital. The skeleton of the structure remained almost exactly the same, but meagreness and weakness took the place of muscular strength and energy.

An intimate relation likewise existed between diameter of column and certain dimensions of the building. The width of the triglyph was always either half the lower or middle diameter of the column. Since two spaces between triglyphs are found over one intercolumniation, widths of the triglyphs must be in proportion to metopes as are diameters of columns to their intervals. The compressed arrangement of the columns, or their closer setting, is repeated in the arrangement of triglyphs.

It further results from relation of width of triglyph to width of portico, as stated in Art. 3, that in the older buildings these also depend on diameters of columns.

Table of Ratios.

	Diam. of Column to Interval.	Triglyph to Metope.	Width of Portico to width of Pronaos.
Temple of Poseidon at Paestum (Mid.Diam.)	3 to 4	3 to 4	3 to 4
Temple of Hercules at Akragas (Mid.diam.)	3 to 4	3 to 4	3 to 4
Temple of Athene on Egina . . . (Low.diam)	3 to 5	3 to 5	3 to 5
Temple of Athene at Syracuse. (Mid.diam.)	2 to 3	2 to 3	2 to 3
Temple of Theseus at Athens . (Low. diam)	2 to 3	2 to 3	2 to 3
The Parthenon at Athens (Mid.diam.)	2 to 3	2 to 3	2 to 3
Temple of Apollo at Bassae. . . (Mid.diam.)	3 to 5	3 to 5	3 to 5

52. Other Proportions.

It would be faulty to treat colonnades only from the point of view heretofore assumed, and to not also take into consideration the ratio between masses of the supporting and supported parts. It is always the conquest of loads or victory over masses, which impresses us in looking at monumental buildings, and in Doric temple architecture, this is especially the clearly expressed capacity of supports to resist the weight of load laid upon them.

The ratio between the mass of a column and the mass of the portion of the entablature resting on it may be most easily observed, if the areas be considered, which these members of the structure occupy on the elevation. The portion of entablature between axes of two columns is of the same size as the part of entablature supported by a single column. Draw

diagonal of rectangle formed by axes of two columns (Fig. 17) and extend it to top of entablature, where it will cut off a distance d ; constructing a rectangle with this and height of column, the surface $d h$ is formed, whose area equals area $a \times h$ of the given portion of entablature. A test of the different colonnades of Doric temples by this method shows, that in archaic monuments entablature area exceeds column area, and that in the developed style, areas of the two parts approximate equality. In the Parthenon (Fig. 18) and in the Temple at Bassae, entablature area equals that of a prismatic support, constructed with the upper diameter of column as a base d .

Equality of volume occurs between a prism with a square base and a cylinder of equal height, if side of the prism is .886, or approximately .9 diameter of cylinder. Assuming as at the Parthenon, that upper diameter of the column is .8 of lower one, then may the cylinder constructed with average diameter of .9 be assumed to equal the conical column in volume, and from this it results that side of a square pier of equal volume is $.886 \times .9 = .797$, or .8 lower diameter of column, so that the mass of a square prism constructed with upper diameter of column equals mass of column. This equality is likewise found in less closely set colonnades of porticos of the era of Alexander, as in inner portico of southwest building at Olympia. (Fig. 19).

In conclusion, it may be added that of all ratios, that of equality (1 to 1) has shown itself as most important. This is found between two successive parts occurring in intimate connection, as between echinus and abacus of capital, the architrave and frieze, and also in most temples, between diameter of column and height of architrave. Otherwise, in parts treated as diversely as possible, equality as a ratio is a condition of good ~~form~~ compatibility, and conversely.

53. Proportions in Egyptian Architecture.

Similarity of figures, was then recognized and required as a condition of good form in architecture in the construction of Doric temples. It is not conceivable that this rule was unconsciously retained by instinct and by thoughtless repetition. It appears to have been transmitted as a secret of the craft in workshops and mechanic guilds of the Greeks. Its first establishment is lost in the darkness of the prehistoric period. We have reason to suppose that since a rule existed for Grecian sculptors, a similar one must have been in use even earlier in architecture, even in Egypt during the famous 18th dynasty.

We shall not be criticised for this review of the land of the Pharaohs. Hellenic purists are disappearing, who hold Grecian art as a purely nat-

ive growth of Greece and absolutely reject the assumption of an oriental or Egyptian influence. The horizon of the history of art is enlarged. The works of F. Thiersch, Roth, and of Braun, have not been in vain. The important point is that we may assume as proved and accepted the connection of the Doric style with Egyptian architecture.

The style of the gigantic edifices at Thebes was developed further in another direction, when the cell was surrounded by a system of chambers; but several monuments of the beginning of that great epoch exhibit the simple plan of peripteral temple, later abandoned or set aside. The most carefully studied temple of this kind was built by Amenophis III on the island of Elephantine, and exhibits in a very striking way the prototype of the Doric temple. (Fig. 20) The cell is similar to the enclosing peristyle in both plan and elevation; its facade, so far as visible, likewise forms a rectangle with ratio of 2 to 3; its base corresponds to the sub-structure of the whole.

We likewise observe in buildings of the same era the ratio of height of architrave to its length (1 to 3), so firmly retained in Doric temple architecture, evidently a rule tested in stone construction at an early date. The use of diagonals of a rectangular figure for determining breadth and height of the members enclosing it appears to have already been common. The cavetto cornices of portals and niches are always arranged accordingly.

Finally, the plan of temple prevailing in Egypt, with its repeated enclosures, exhibits more less clearly the general principle of repetition of primary figure. This is here given by the cell in connection with a transverse portico. (Edfou, Denderah, Erment, etc.) This subdivision is indeed first and most clearly apparent in the temple structures of the Ptolemaic period. We shall therefore not go too far in saying, that as Pythagoras of Samos brought mathematics of Egyptian sages to Greece, so in remote antiquity, architects, now unknown, transplanted the type of temple architecture and principle of similarity from the land of the Nile to the shores of Greece.

Chapter II. Proportions in Ionic Architecture.

54. Ionic Temples in Attica.

We will consider Ionic temples in Attica, then those in Asia Minor, finally examining works by Roman architects. The temple of Nike Apteros at Athens and the destroyed temple on Ilissus have colonnades only at ends of the cell; the portico and cell coincide in front view. Equal height and width were required, and as in the cell of the Doric temple, while the ratios of side and front differ. But the same similarity of cell and

portico exists in both side view and facade of the Doric temple. To obtain similarity of the inner and outer forms, high entablature and stylobate were required for the short cell of the Temple of Nike. (Figs. 21, 22). The lowness of these parts in the Temple on Ilissus is required by the oblong form of cell. (Fig. 23). Both rectangles have a ratio of 1 to 2.

The Erechtheum is a remarkable example of an unsymmetrical though harmoniously arranged structure, but it obeys the law of agreement in another way. The two porticos added at sides of the principal structure have in plan the same shape as it (ratio 2 to 3), (Fig. 24), are entirely different in dimensions, level, and design, but are similar to each other in outline (width: height), if the parapet wall or, which the caryatids stand be taken with them as height of supports. (Fig. 27)

The entablature of this Attic-Ionic temple is in composition analagous to the Doric entablature. The architrave and frieze are equal in height, but are otherwise as different as possible. The architrave is plain or composed of horizontal bands; the frieze and its relief sculptures form a series of vertical figures. Upon it rests the cornice, just as the entablature lies on the columns, and the ratio of the height of geison to that of frieze is the same as that of height of entablature to height of columns. The heavy ratio of 1 to 3.5 is repeated on the Temple of Nike, (Fig. 25), and the lighter one of $\frac{1}{4}$ 1 to 4.2 is found on the Erechtheum (Fig. 26). The projection of geison is also in proportion to projection of entablature in front of cell wall. Taking the cornice as including cymatium and roofing slab, it is again the same ratio to entire entablature, as this is to height of columns. The same proportions are repeated on a larger scale in the design of the caryatid portico; the statues bear the same proportion to substructure and to their entablature, as that of the sculptured frieze to architrave and to crowning above it.

55. Ionic Temples in Asia Minor.

Varying from the preceding, the Ionic entablature in Asia Minor is composed of four courses, successively diminishing upwards. This is shown by the temple at Priene, (Fig. 28) the Temple at Magnesia, and the Mausoleum at Heliokarnassus. The ratio of architrave to frieze is the same as that of frieze to dentil band, and that of dentil band to cornice. Each member of the series has the same proportion to the succeeding one, and the ratio of any division of the entablature to the entire portion above it is likewise always constant (a geometrical series). An attempt is made in Fig. 28 to construct a scale for gradual diminutions for the divisions. The height of frieze is actually greater than given by this method; but

a portion of the frieze is always concealed from the eye by the architrave moulding, so that the frieze therefore appears lower than it really is. It should further be noticed that the cymatium or crowning member of a division of the entablature is always in a fixed ratio to it. This is also true of the Ionic entablature found at Olympia. The same regular diminution of courses of stone and of their crowning mouldings appears on the entablature on the interior, where it is terminated by the coffers.

The plans of temples in Asia Minor either resemble the Doric peripteral temple (Priene), retaining harmony of cell and of peristyle on the ground plan, or a second complete peristyle is employed, producing a dipteral temple. (Ephesus, Miletus). According to Vituvius, Hermogenes invented the pseudodipteral temple by omitting the inner colonnade. The necessity for treating the cell and peristyle conformably then became greater, on account of the greater lightness of the portico, than in the dipteral temple. Correspondence in plan was more easily obtained than in outline, and that was only produced by cutting off a part of the cell wall by a string-course, or by separating a substructure or base from the cell. (Fig. 29.) This is shown by later Temples of Aizani, Aphrodisias, and Saaltec. In the Temple of Artemis at Ephesus, the cell appears to have had a high base decorated by sculptures and of the same height as the sculptured portion of the shafts of the columns.

53. Grecian Secular Buildings.

A few Greek secular edifices exhibit the same principle of harmony. On the front elevation of the Tower of Winds at Athens, the inner and outer outlines of porticos are similar to each other. (Fig. 39). The two rectangles are concentrically arranged, and the general form of the tower is arranged about the same centre. As the entablature is to the columns, so is the crowning cornice of tower, with sculptured frieze beneath it, to the tower. Entablatures of the porticos are composed of constantly diminishing parts, as in Asia Minor (Fig. 31); but they correspond in outline to the Corinthian capitals beneath them, if these are viewed diagonally. The angle of the entablature is indeed most apparent; the diagonal profile of the capital lies in the same plane with it. These two profiles harmonize in all essential points.

As the abacus of the capital is to the bell, so is the cornice to the entablature. The projection and height of these parts bear the same ratio to the parts beneath them in both figures; the outline enclosing the acanthus foliage is similar to the projecting moulding of the architrave. The same similarity of profiles of capitals and entablature is shown by the Monument of Lysicrates, but on account of the circular plan, it is

not the diagonal but the normal profile that corresponds in outline. (Fig. 32)

The same is also found in the Doric style. On the monument of Thrasyllus at Athens (Fig. 33) and on the temple of Artemis at Eleusis, profiles of antae-capitals harmonize generally with those of entablature. The projecting portion of abacus corresponds to projection of geison; the height of hawkskill moulding of antae-capitals with its fillets is in proportion to frieze of entablature, and the flat band to the architrave. The palmetto-band on the necking of Ionic antae and on the cell wall is analogous to the sculptured frieze of the entablature.

57. Ratio of Masses.

Finally, the ratio of masses of supports to those of loads is to be considered. In Doric colonnades as a rule, the mass of entablature exceeded the mass of column. In Attic-Ionic monuments, the columns were further loaded by a pediment, and mass of the column was therefore greater than mass of the entablature. In the Ionic porticos of Asia Minor, entablature is universally lighter than column. The lightest load rests upon the Corinthian capital. The ratio of masses is to be further considered in the case of complex buildings in stories. The upper story may be higher than the lower one, if its mass be smaller (Monument of Lysicrates, Tomb at Mylassa). The same ratio prevails here as that between mass of a statue and that of its pedestal; the latter must be the greater of the two.

Chapter III. Proportions in Roman Architecture.

58. Italian Temples.

New forms appear in Roman temple architecture, but in spite of all transformations, ancient principles still prevail. The Italian temple has a portico before the cell only and stands on a high substructure, only ascended in front. Yet the same harmony is produced here as in the Attic-Ionic temples. For the cell and the entire edifice form similar figures in side view (Fig. 34). Most rectangles also have here simple numerical proportions, which are repeated. The substructure and the entablature add as much in proportion to the height of the cell, as the projecting portico adds to its length.

The sides have the following numerical ratios (height to length):

Temple of Fortuna Virilis at Rome - - - - -	-2 to 3
Temple of Jupiter at Pompeii - - - - -	-1 to 2
Temple of Antoninus and Faustina at Rome - - - - -	-1 to 2

Harmony is more perfect in circular temples than in any other form. The visible cylinder of the cell is similar to the entire structure. (Temple of Vesta at Tivoli). If the columns stand on steps only, the cell

must have a string-course in order to not seem too high.: (Temple of Vesta, Rome).: We meet everywhere with similarity of internal and external forms in the varied ground plans of the temples of the imperial period.: When the cell is enclosed along both sides by porticoes, facades of cell and of entire building are similar to each other (Temple of Mars Ultor and Temple of Dioscuri on Roman Forum).: A string-course separates the cell from the base, which is then analagous to the substructure beneath columns. The similarity of the cell to peristyle is carried farthest on the Temple of Jupiter at Bealbec.: (Fig. 35).:

In abnormal plans of temples, like that of Concordia at Rome, (Fig. 36) where the portico before the cell is narrower than that, the two still have similar forms.: The portico of the Pantheon harmonizes with the circular edifice, since the two have the same ratio of width to height, although otherwise so very different.: The pediment is itself too much inclined, but harmonizes with the dome covering the cylindrical portion. The interior of the Pantheon everywhere affords examples of beautiful harmony, possessing almost Grecian purity.: The equality of height and width of the entire interior is repeated in the openings of the great niches.: The pilasters of the upper order are grouped just like the columns and pilasters of the lower; the upper arrangement being repetition of the lower at half size.: Finally, the columnar enclosures of the small altars harmonize with the two great pilasters which flank the mass of the pier and form on the sides of the small niches a concentric symmetrical bordering.: (Fig. 37).:

59. Triumphal Arches.

Triumphal arches merit special notice by their original and harmonious composition.: The rule is adhered to, that the two columns or pilasters enclosing the archway must form a figure similar to that of the archway itself.: The inner pair of supports carry an arch and the outer pair a horizontal entablature, this contrast being harmonized by the coincident ratios of width to height.: (Fig. 38).:

On the Triumphal Arch of Titus, (Fig. 39) the square is used as the basal figure and is generally retained, though the attic is rather too high, a defect avoided in the Arch of Trajan at Beneventum.: On the Triumphal Arch of Trajan at Ancona, (Fig. 40) a rectangle with greater height than width and a ratio of 1 to 2 for its sides is employed for the opening, for the inner and outer lines of the adjacent engaged columns, as well as for the entire outline.: The columnar order of the portal is further enclosed by the mass of the structure with proportionally similar width and height.: At Hadrian's Gate in Athens, (Fig. 41) three pairs of sup-

ports with similar intervals enclose the passage way, the upper story repeating the same form.

The Triumphal Arches of Septimius Severus and of Constantine (Fig. 42) with triple openings, exhibit the same relation between the archways and their enclosing members. For practical reasons, the side openings for persons on foot are narrower than the principal gateway, intended for riding or driving. The returned portions of the broken entablature must here be taken with the columns, when these are compared with the piers of the archway. The impost cap is even analogous in composition to the cornice. But if the two columns at the sides of the principal archway be taken alone, they enclose a square central area (height of columns being equal to distance between them), and the mass of the entire structure encloses this at the sides and top by an equal width. If the gateway be further assumed as filled by a crowd of men (5 feet high), it also becomes square and harmonizes with the adjacent columns, as in case of the other monuments. The side archways then approximate the form of the principal gateway.

Moreover, the height of attic of Arch of Constantine is so arranged as to make the middle archway relatively as high as the side archways; (Fig. 43). or the facade forms a group of three similar parts standing beside each other. As the horizontal entablature extends above the principal gateway, and the space for inscription covers the attic, so are bands of reliefs and sculptured panels placed above the side archways. Harmony in proportions of masses, but variety in treatment of analogous parts, are leading principles in Roman composition. Simple numerical ratios always participate here. The distances between the axes of columns are in proportion as 2 : 3 : 2. The principal gateway forms a rectangle whose sides are as 3 to 4; height of columns is twice the height of pedestal, etc.

60. Proportions of Elevation.

The relation between the parts of elevation successively above each other must still be shown. This most plainly appears in the side view of the triumphal arch. (Fig. 44). The subdivision of principal story into pedestal, column, and entablature is also repeated in the attic. The ratios of these parts of the elevation to each other are as 2 : 4 : 1. The pedestals of columns and of statues are subdivided in a strictly similar manner. The same analogy appears in the elevation of the Incantada at Salonica. (Fig. 45). The repetition of the design of the entire structure in its subdivisions is very clearly shown in the outline of the Temple of Fortuna Virilis (Fig. 48). The cap of substructure is a repetition of the entablature, and the base of substructure repeats the substruct-

ure itself, the profile of the base corresponding to the base of the column taken with the steps. The similarity of subdivision of the pedestal and that of the entire order is most accurate on the Arch of Septimius Severus. Compare also the shrines of the Pantheon with the minute subdivision of their bases.

31. Subdivision of Entablature.

Repetition of the general in its parts also prevails in the subdivision of the entablature. While in Grecian architecture the entablature extends upward in an arrangement corresponding to the combination of ceiling and of roof, subdivision of the Roman entablature becomes a purely external decoration. The cornice with its ornamentation here forms the chief part of the entablature and predominates over the remainder. The mouldings crowning the architrave are reduced and simplified imitations or precursors of the cornice. This harmony already occurs in the profile of the Grecian entablature; it is also very distinctly shown in profiles of Italian entablatures, and it governs the subdivision of richly sculptured marble entablatures of the Roman imperial period. In the Grecian entablatures, the upper fascia of the architrave with its mouldings and the crowning fillet is a model of the entire entablature. (See Erechtheum Temple of Nike, Temple of Priene, and Tower of Winds; Figs. 23, 25, 28). The subdivision of the Italian entablature is such (Fig. 47), that the upper fascia of architrave bears the same proportion to the mouldings crowning it, as that of frieze to cornice. (Caps over doorways at Cori and Tivoli and entablatures at Pompeii).

Both modes of subdivision have been applied to Roman profiles. The Grecian principle is followed in entablatures of Temple of the Sun by Aurelian (Fig. 49), with its architrave divided in two fasciæ, and of Temple of Antoninus and Faustina (Fig. 48), as well as in those of Temples of Dioscuri and of Concordia on the Roman Forum, divided in three fasciæ.

The Italian proportion is employed in almost all other examples now remaining; as the cornice is to the frieze, so is the crowning moulding of the architrave to upper fascia (Fig. 50). The three principal divisions of the entablature, cornice, frieze, and architrave, are usually of equal height (omitting cyma of cornice), and correspondingly the crowning moulding of architrave, the upper fascia, and the middle fascia with its moulding, all form equal parts. The same contrast of moulded and plain members placed side by side and equal in height is repeated in the lower division of the cornice.

Moreover, the cornice usually bears the same proportion to the height of its lower portion as the fillet of the architrave to its moulding. (

Orders of Coliseum, of Portico of Octavia, of Shrine of the Pantheon, and of Temples of Dioscuri and of Concordia). Where the crowning moulding of the architrave has a cavetto according to custom in Asia Minor (Temple of the Sun by Aurelian (Fig. 49) and Temple at Palmyra (Fig. 51), the cyma must always be taken with the projecting cornice in the comparison. Yet this also occurred in the Pantheon, on Temple of Vespasian, and on Forum of Trajan. Where offsets of the architrave are decorated by ogee mouldings ornamented by leaves, those exhibit a regular increase in height towards the architrave cap moulding. An example of this and of the repetition of main divisions of the entablature in subdivisions of the architrave is the beautiful cornice from interior of the Pantheon above the entrance doorway (Fig. 52).

A more important relation also exists between the profile of the capital of column and that of entablature. As on the Tower of Winds at Athens (Fig. 31), the two profiles correspond in projection when viewed diagonally, as well as in subdivisions in height. The geison, either with or without the cyma, corresponds to the abacus, and the three divisions of the entablature to the three rows of leaves on the bell. The modillions that support the geison are analogous to the volutes which curve beneath the abacus. (Fig. 53) From this point of view, the Composite capital is completely justified. The minute subdivision of the cornice is especially prefigured by the bold and ornate division of the surface of the bell. The same relations are found in the plainer treatment of Roman, Doric and Tuscan orders, between profiles of the capitals of columns or pilasters and the entablature. (Fig. 54). Compare with this the Grecian example (Fig. 33).

While the Grecian style thus places large and simple forms beside each other, apparently without adjustment, but holds them in stricter dependence upon the entire structure, Roman architecture, after this connection is loosened, is pleased by repeatedly subdividing the parts of the entablature into forms similar to itself. The gracefulness thereby obtained affords compensation for omitted sculptured ornamentation of the Grecian entablature. (Compare profile from substructure of Temple of Mars Ultor, Fig. 55, with that of Doric capital from Theatre of Marcellus, Fig. 56).

62. Statements of Vitruvius.

As Grecian and Roman architects were guided by this primary principle, the question arises whether it has nowhere been stated? Such an important point of theory could not be kept secret and could not be assumed as self-evident. We must seek whether the basal principle was stated anywhere in the writings of the ancients. The writings of Grecian architects

and the commentaries on their temples are indeed lost, but the work by the Roman architect Vitruvius, dedicated to Octavianus, is preserved, and since this was drawn from Grecian sources, information in regard to our problem may be expected from it. He indeed spoke of this in three places, although not with all detail and clearness that might be desired, yet so plainly as to permit us to perceive that similarity of form was a transmitted law of architecture.

First, where Vitruvius speaks of the rules of Architecture in general (Book I, Chap. 2), and he speaks of the construction of temples in particular (Book II, Chap. 1), he requires "symmetry" to be observed. He does not mean by this the equality of two halves, making one side a duplicate of the other; no special law being needed for this. His explanation is different, and this rather arbitrary law runs thus in Gwilt's translation = "Proportion is that agreeable harmony between the several parts of a building, which is the result of a just and regular agreement of them with each other; of the height to the width, this to the length, and each of these to the whole." Thus the parts must harmonize with each other and with the whole; they must correspond to each other and to the form of the whole. By this harmony and correspondence is undoubtedly to be understood similarity of forms of the parts and of the whole.

Take the opinion of Euclid, the ancient master of geometry, where he treats of the similarity of figures in Book VI of his Elements, he employs the word "analogous" in definitions and theorems. Thus in Theorem 4: "If triangles have equal angles, the sides opposite equal angles are analogous to each other". Cicero also rendered the word "analogia" by "proportio" in his translation of the Timaeus. Return to Vitruvius, who says (Book III, Chap. 1): "The design of temples depends on symmetry, whose rules architects should be most careful to observe. Symmetry is dependent on proportion, which the Greeks call "analogia". Proportion is a close adjustment of the sizes of the different parts to each other and to the whole, as on this proper adjustment symmetry depends."

The explanation which Vitruvius gives after the definition quoted is indeed different from what might be expected, being that as in the human body, so in an architectural structure, should all parts form a definite repetition of a unit of measure. To express this, did not require that detailed definition of symmetry. Did Vitruvius possibly reproduce the Greek definition without fully understanding it? He ends the chapter with the words (omitted by Gwilt, but translated from Reber's Vitruvius): "We admire those, who, when they built the temples of the immortal gods, so arranged the parts of their works that taken separately or as a whole,

their subdivisions have been treated in accordance with proportion and symmetry".

Chapter IV.: Proportions in Early-Christian and Mediaeval Architecture.

63.: Early Christian Basilicas.

Let us trace these ground principles further in the History of Architecture. Paganism was overthrown, temples of the Gods fell into ruin and new ones were built no longer. Religious traditions of paganism were broken and extinguished by the victory of Christianity, which likewise caused architectural traditions to pass into oblivion. Instead of antique temples, Christian basilicas were erected, and church architecture was steadily developed in buildings at Ravenna, in domed structures in the Byzantine Empire, and in the Romanesque and Gothic architecture of the West. If the theory of proportion be not based on caprice, but on the nature of the case, and of the spirit of the man, on the laws of the beautiful, then will it appear in these new domains also.

No value was placed on the exterior of the basilica, so that we can expect no systematic treatment there. Chief emphasis rests on form and treatment of the interior. The rule is general, that side aisles must have the same ratio of height to width as the centre aisle. (St. Apollinare-in-Classa at Ravenna; Cathedral of Parenzo, Fig. 57). The most important internal effect of the basilicas depends on the long rows of columns. These exhibit in perspective a series of continually diminishing similar figures with regularly lessened widths. On this fact is chiefly based the beauty of the uniform rows of columns.

64.: Early Christian Centralized Buildings.

The treatment of centralized structures is of a different nature. Already in Roman architecture were the abutments of the dome transformed into a circle of niches. These are now treated similarly to the principal space. It is found in St. Vitale at Ravenna (Fig. 58) that the columns of the niches enclose figures similar to those enclosed by the great piers of the octagon of the dome. The same is true in the apses beneath the great semi-domes of the Church of St. Sophia at Constantinople. The number of columns in the second story is increased so as to retain the same proportion of height of column to intercolumniation. For there are seven intervals in the upper story to five in the lower, while the heights of the stories are as five to seven. It is scarcely necessary to refer to the usual plan of the Byzantine church, where the main dome is accompanied by several similar side domes.

65. Romanesque Churches.

The harmony in Romanesque churches between center and side aisles, and principal and side apses is merely approximate. The round-arched frieze and the low-arched gallery are repetitions of the arch beneath them, like the triglyph-frieze above the colonnade. Proportions of the stories are frequently fixed by the treatment of the openings. Thus, where two arched openings are placed above each arch of an arcade, the upper columns have one-half the height of the lower ones. (Cathedral at Pisa; Cathedral at Autun; Church of St. Saturnin at Toulouse, Fig. 59). The similarity of side aisles to center aisle is frequently expressed in the facade. In St. Zeno at Verona, the portal also repeats the same form.

66 Gothic Churches.

We now enter the domain of the Gothic style. It differs extremely from the classic styles and completely breaks from antique traditions. It partly adheres to the older church architecture, but otherwise develops a very peculiar nature. This is that all large forms are repeated in details or imitated in smaller parts. Pinnacles, gables and blind tracery are repetitions of towers, gables and window tracery. The manner in which these elements spring from the mass of the building corresponds to tree growth, whose branching and ramifications, even its most delicate twigs, continually repeat a fixed form. Where this does not overload the masses of the building, examples of simple and clear treatment are to be found. Thus on the Church of St. Elizabeth at Marburg. (Fig. 60).

The simple numerical ratios of principal dimensions are first emphasized: height and width of three-aisled interior equal each other; width of middle aisle from center to center of piers is twice the width of side aisles. The plain facade with two towers is effective by its proportions, by the fine appearance of the masses, and invites study of the proportions.

Center lines of buttresses divide width of the facade in proportion of 2 : 3 : 2. The chief lines dividing the height are accented by foiled bands, which show that height of the tower to base of spire (bell story) is twice the height of nave. The shaft of the tower from cornice of nave to bell story has the ratios of 4 : 2 : 5 to this and to the spire. To this larger form correspond the small towers at angles of bell story. The opening of the doorway, the wall area containing the portal, and the central area of the facade above this, are figures similar to that of the facade of the church below bell story.

Above the central area of the facade, whose large and rich tracery window forms the principal figure, the applied tracery with gables and fin-

ials is arranged like the spires with their gables and pinnacles above the facade. The high wall spaces of the towers with their slender windows are enclosed by masses at sides and below, in proportion to the two windows of the facade beneath them. Especially effective is the visible reduction of masses by offsets with increased heights of the stories. The higher the stories of the buttresses, the more is their width diminished, so that approximate equality of masses results in two successive portions of the piers.

The most beautiful window tracery is composed of larger and smaller mutations, which repeat the larger, as the separate parts do the whole. With harmony in principal ideas, the greatest diversity in other parts is required to avoid monotony and produce a pleasing contrast. The capitals of the little shafts of a Gothic pier are frequently decorated by leaves whose mid-ribs or stems bend over, spring from and intersect each other, just like the ribs of vaults above them; this is here given on a small scale, but is to appear on a large one.

We limit ourselves to noting that the facades with two towers for the finest cathedrals are subdivided to produce similar rectangles, that the central space with rose window is usually similar to the entire facade, and that heights of stories of towers either continually increase upwards, producing an aspiring tendency, or diminish as the stories become narrower, like minarets in Cairo, whose beauty consists in similar proportions of stories, and in the diversity of their ornamentation. The examples show that Gothic made the most extensive and frequent use of the principle of repetition of main forms in details.

Chapter V. Proportions in Renaissance and Modern Architecture.

87. Churches in Italian Renaissance.

The Middle Ages drew to an end; chivalry and romantic poetry disappeared; the great Gothic cathedrals remained unfinished. One of the greatest changes in taste commenced. Other ideals were sought and attention was directed to classical antiquity, slightly known and but little esteemed. Admiration of this produced the architecture of the Renaissance. With the architecture of the Greeks and Romans, the ground principle of architectural proportions was again revived and applied. Whether architects first employed this in practice and afterwards in theory, or conversely, or whether it was done with clear understanding or not, the former may be true, for it certainly appears in the most beautiful monuments of the Italian Renaissance. The same elegant proportions appear as in antiquity, while harmony is no longer produced by approximation, but is geometrically exact; in its rich development, Renaissance architecture affords even

more abundant examples and proofs than do the remains of antiquity. Examples present themselves at every step taken under a guide like Buhlmann.

In church architecture, Brunelleschi introduced the same ratio of breadth to height for middle and side aisles (St. Lorenzo and St. Spirito at Florence); Baccio Pintelli exhibits these harmonies on facades of churches at Rome (Fig. 81), extending to their towers. In churches with a single aisle, for which Alberti gave a model in St. Andrea at Mantua, apses between abutments of the dome repeat the form of transverse aisle, and are in the same proportion to this, as are the smaller niches to the apses. Still more decidedly in the Church of St. Maria di Monti in Rome do the chapel openings in the piers imitate the main interior.

The subdivision of the Roman triumphal arch (outline of side division being similar to that of middle portion) reappears on the monumental tomb of Dodge Vendramini at Venice, as well as on Tombs of Prelates in St. Maria del Popolo at Rome. Subordination of lesser to principal arches occurs most simply in the cross section of the Church of St. Salvatore in Venice (Fig. 82) and is repeated in the altars and wall tombs of the church.

In centralized churches, smaller domes follow principal dome in plan and elevation (Fig. 83). The drum beneath the dome soon formed an upper story and had externally the same ratio of breadth to height as that of the entire church beneath it. Examples are St. Pietro in Montorio at Rome (Fig. 84), Consolazione at Todi by Bramante, and Church of St. Peter at Rome as designed by Michael Angelo (Fig. 85). It is a merit of Michael Angelo, that he succeeded in retaining this harmony in erecting the Church of St. Peter, when he attached to the exterior of the church a single great order of pilasters and repeated its ratio to the attic in the arrangement of the columns of the dome. (Compare similarity in outline of upper and lower stories of Roman triumphal arch Fig. 44)

88. Private Buildings in Italian Renaissance.

When we turn to private buildings in varied forms, we find the same law in all their parts, in general and in detail. A part added or prefixed to the principal mass must accord with that in its proportions. The upper story of Pitti Palace at Florence is similar to the entire building (half as long and half as high); projecting porticoes of Villa Rotonda repeat the form of the building, etc. (Fig. 86).

89. Subdivision of Facade.

This rule for subdivision of the facade was first made in Florence; as the string-course is to that story, so is the entablature to the palace. This principle was first applied on the Strozzi Palace (Fig. 87) with great success. The entire height is divided in three nearly equal parts. Each

of the two lower stories terminates with a belt-course, which with the course of ashlar next beneath, occupies one-eighth part of the height of the story. Corresponding to this and crowning all three stories, the entablature has three times the height of a belt course, and with its frieze is one-eighth of the total height. The same is true of the Piccolomini Palace at Siena. On the Gondi Palace at Florence, the lower story is characterized as a substructure by a bolder rustication, and the entablature is made in proportion to the two upper stories by having twice the height of a belt-course.

This is also the subdivision of most Roman palaces. Y The string-course, that crowns the lower story and marks it a substructure, bears the same proportion to this, as does the entablature to the remainder of the facade (1 to 12 on the Negroni Palace). The simplicity and decision that distinguish Florentine are wanting in these facades. The Farnese Palace is also effective, for it follows the simple division of the Strozzi Palace and ends with an entablature in proportion to the whole as the string-courses and bands are to the separate stories. The entablature has again thrice the height of belt-course, if vertical heights are not compared with each other, but actual distances between upper and lower edges are taken, the dimensions that would be least fore-shortened in perspective.

70. Architraves of Doors and Windows.

Rules for architraves of doors and windows exist, and are to be referred to the antique. When a window opening is higher than wide, an enclosing architrave of uniform width is unpleasing. This absurdity is more apparent for wide architraves or narrow openings, than for narrow architraves or openings wider than high. Architraves of openings having greater height than width require an extension above or below, or even both, to make the external and internal outlines similar. For rectangular openings wider than high, there is opportunity to widen the enclosing frame at the sides (Fig. 68). As the cell of the antique temple was surrounded by columns and their entablatures, making the external outline similar to the internal, so is the same true for Renaissance windows and portals. When a simple window architrave rests directly on a string-course, this participates in the treatment of the enclosing member, and there usually exists harmony of inner and outer outlines. (Window of Massimi Palace at Rome).

Breadth and height of enclosing members are usually arranged merely in accordance with diagonals of the opening. This is the case if pilasters or half columns are also added to the architrave of uniform width, as on Bartolini (Fig. 69) and Pandolfini (Fig. 65) Palaces, etc., in accordance

with the shrines in the Pantheon. Peruzzi and Vignola generally employed these diagonals for architraves of doorways, although a base like that of the window was there impracticable. If the breadth of the enclosing member is one third the width of the door, the lintel with its cap is made one-third the clear height of the doorway (Figs. 71, 72) or if the opening of the doorway is twice as high as wide, the height of the lintel is twice the width of the architrave.

71. Wall Openings and Surfaces.

Proportions of wall surfaces enclosing an opening in the wall are of special importance. Proportions are most clearly shown if round-arched window openings are enlarged to rectangular form and diagonals are drawn. Either the diagonals of two adjacent windows intersect below upper limiting line of wall surfaces (Fig. 73), or they intersect the upper margin of the wall space vertically above sides of adjacent openings. (Fig. 74) In the first, the wall surface is so divided by the axes of the piers, that it is a proportionally uniform enclosing member; in the second, the entire mass of wall surrounds the opening with proportionally uniform width.

The first method is used in the Pitti Palace in Florence (Fig. 78) and with more or less accuracy by most Roman palaces with predominating wall surfaces, especially Bartolini and Pandolfini Palaces at Florence (Figs. 69 and 70) The second system is retained in Riccardi, Strozzi, Gondi, and Guadagni palaces. (Figs. 75, 79). If width of the pier equals width of the window, then is the wall above equal to height of windows (upper story of Strozzi Palace). If piers are narrower than openings, as on the Guadagni Palace, height of the wall above crown of arches is also in the same proportion lower than windows. In this example, the first harmony is also produced. That the plain wall surface between and above windows must have equal widths is to be referred to the first system of harmony and it is true if height of the windows is twice their width (Pitti, Bartolini and Pandolfini Palaces).

72. Arrangement of Pilasters and Columns.

The same conditions are required in subdivision of facades by orders of pilasters. Pedestal of the pilaster is most intimately related to pedestal of the window beside it. They either form two figures similar to each other, or the pilaster order encloses the window at sides and above in accordance with its diagonals and at proportionally equal distances, thus taking part in the enclosure. Examples of the first are given on Rucellai Palace by Alberti (Fig. 77), lower story of Farnesia (Fig. 78) and Stoppani Palace, as well as Porto Palace in Vicenza; examples of the other kind, by upper story of Farnesia (Fig. 78), court facade of Farnese

Palace (Fig. 80), and principal story of Ossoli Palace, all by Peruzzi. The harmony of the window and the pedestals of pilasters or columns, in geometrical similarity, is carried out by Michael Angelo (Palace of the Senators), by Galeazzo Alessi, Sansovino, and Palladio, and the principle is obeyed, that the two supports must be of forms as different as possible. Moulded window jambs are contrasted with plain pilasters, and those with half columns, Hermes figures or rusticated columns. The early Venetian Renaissance also affords beautiful examples (Scuola di S. Marco).

The same proportions also determine the arrangement of pilasters and columns combined with arcades. As on Theater of Marcellus and on Roman triumphal arches, the pair of columns or pilasters should enclose the same figure as the pair of piers (Arcades by Peruzzi and by Palladio, Fig. 81, etc.) To this harmony is due the harmonious effect of Palladio's Basilica at Vicenza, in spite of its ungraceful wide arrangement (Fig. 82); the small columns have here a treatment of their bases with an analogy to pedestals of principal order.

73. Division of Wall Surfaces.

The subdivision of surfaces of walls also requires obedience to the law, that forms of parts must correspond to that of the whole. This is especially true of that principal portion of the wall surfaces made prominent by size or ornamentation. This is generally found in Pompeian wall paintings; it is continued by the Renaissance and is generally employed in the Rococo style. Examples are shown in the principal apartment of the Massimo Palace (Fig. 83), halls of the Palace of Caprarola, and in Assembly Hall of Grand Council in Doge's Palace at Venice. A very common arrangement is to place the door in one wall near an angle, thus taking as much from length of the wall as the wainscoting does from its height.

The same is true for facades, if windows form groups or divisions of different widths. On Palace del Consiglio at Padua, the central group of windows of the upper story is similar to the main portion and to the entire facade, and on Sapienza at Naples, the loggia is similar to the whole. The facade of San Lazzaro in Venice may serve as an example of a design in the Barocco style (Figs. 84, 85).

In panelling the leaves of doors, such forms are preferred as correspond to that of the entire door, and they are surrounded by mouldings that imitate the mouldings of the architrave (Doorway of the Vatican, etc.) This is especially the case in Rococo.

74. Arrangement in Detail.

Subdivision of details likewise obeys the law of analogy. Enclosures of windows with pediments are structurally treated in accordance with the

analogy of the building. Entablatures of the windows correspond to the main entablature, their projection and height being proportioned by it. As many times as the entablature goes into height of facade, just as many does entablature of window go into height of the window order (Fig. 70). Cornice and frieze of Pandolfini Palace go eight times into the total height, and entablatures of the windows repeat all members of the main entablature. and go eight times into height of window order. The corresponding proportions on Bartolini Palace (Fig. 69) are 1 to 8 and 1 to 7. Where the ground story is a substructure, the entablature corresponds to the height of the remainder of the facade. This is approximately true of Roman palaces of several stories. If the height of the window order is one-third height of facade, its entablature is one-third height of the main entablature (Sciarra and Negroni Palaces at Rome). On facades with orders of pilasters or columns, their entablatures control the lintels of the windows, if these do not take the place of the main entablature. (Fig. 76).

75. Profiles and Decorations.

Profiles also exhibit an endeavor to bring smaller parts into harmony with greater. The crowning cornice and the bed mouldings under it, together with the frieze beneath form a group, repeated in the profile of the architrave (in its upper portion or its entirety). Peruzzi and Vignola prefer to follow this mode of subdivision and to arrange the parts of the architrave in a continually diminishing series (Fig. 86). The harmony between profiles of capitals and of entablatures in the antique was again adopted. Height and projection of the bands are proportional to each other, and ornamentation of necking of pilasters is analogous to decorations of frieze. Rosettes on necking of the column correspond to the intermittent ornamentation of the triglyph-frieze, and the foliage of the capital, to a frieze covered by foliage. Beautiful examples are found in the early Venetian Renaissance, the Orders of Alberti, Bramante, etc. The Orders of Vignola and of Palladio are well known in innumerable editions and owe their popularity less to ratios expressed in entire numbers, than to prevailing harmony of different parts with each other.

Annular members beneath the abacus (Fig. 87) have the same proportion to it, as do the frieze and architrave to the cornice. At the offset in the architrave the two fascias harmonize in their equal ratios of depth to width. In Vignola's Doric entablature, the height of geison has to the frieze and architrave beneath it a ratio (1 : 4.5) similar to that of height of architrave to height of column (1 : 4). For Vignola's Ion-

ing, and the geison of the entablature, are supported by members of ogee section and of relatively equal heights. In Vignola's Corinthian Order the geison covers the rest of the entablature (1 : 6) as the abacus covers the bell of the capital (1 : 6), and approximately as the entablature is to the column (1 : 5). This law extends to subdivision of the ornamentation. The acanthus leaf is divided into distinct parts and these are likewise subdivided into lobes of similar form. Arabesque ornamentation repeats the continuous leading forms in the interlaced delicate elements, etc.

76. German Renaissance.

It is not necessary to trace this principle in the remaining architectural styles. The German Renaissance is characterized by rich combinations of different forms more than by elegant proportions. On the remarkable facade of Otto-Heinrichs-Bau in the Castle of Heidelberg (Fig. 89), strict harmony of proportion between double windows and pilaster-order occurs, with all its diversity in form, and on the characteristic old Rathaus in Zurich, depressed forms of windows and wall surfaces harmonize with the whole (Fig. 90).

77. Statements of Alberti.

If we review the Renaissance, the question arises, whether the architects of that period did not clearly state that law, so faithfully obeyed in practice. As Vitruvius is witness for antiquity, so is Leo Battista Alberti of Florence (died 1472) for the 15th century. This architect was the scientific founder of the Renaissance in Italy and expressed the leading idea in another manner, through easily intelligible. The beginning of his work "De Re Edificatoria" is a chapter on "Lineamenta". This requires parts of the structure to correspond to each other in angles and lines, which is to be attained by establishing angles and lines of fixed direction and combinations. Book VI, Chap. 5, gives a description of a good design ending with the words: "All things must be adjusted to fixed angles by parallel lines". (Alberti's facade of Rucellai Palace, Fig. 77). Lines and angles drawn beforehand are therefore a means of obtaining proportional forms. In this way was obtained that "Rhythm of the Masses," in which Burckhardt, most thoroughly acquainted with the Renaissance finds the art idea of the Cinque Cento period.

78. Architecture of Modern Period.

If we direct our attention to masterpieces of modern architecture, these also confirm what we found in the Antique and traced through the Mediaeval period. We mention the facades of Main Guard-House and of Museum at Berlin, both by Schinkel (Fig. 91), Old Pinacothek and Propyleum in Mun-

ich by Klenze (Fig.: 92), leaving an analysis of these buildings to the reader.: In the last example, two systems of similarity are to be distinguished; the upper stories of the towers are treated similarly to the entrance portico, and the doorways are analogous to the entire towers.: The rule is so evident and so general, that in innumerable modern residences, facades are subdivided according to similarity of forms. A group of windows or a richly treated portion of the facade usually repeats the main form, the form of a window corresponds to the portion of the facade to which it belongs, etc.: By a correct feeling, in framing copper plate engravings, etc., margins on the ends are made wider than those on the sides, or in ornamentation of title-pages, the decoration encloses a form similar to that of the entire page.

Chapter VI. Influence of Perspective upon Proportions.

79.: Perspective.

The dimensions of a building change their respective ratios in perspective according to the point of view.: Therefore fixed numerical ratios between all three space dimensions of the object can never be determined at once by the eye, though the harmony of a building is not expressed in its geometrical projections alone, but perspective as well.: This opposes the assumption that harmony depends on simple numerical ratios and confirms the theory of analogy and similarity of forms.: These also occur in the foreshortened view.: Since this is a comparison of forms, which lie in the same or in parallel planes, these parallel dimensions are foreshortened equally within certain limits. In greater foreshortening of a facade, if widths and heights of parts are compared, the eye no longer recognizes even great differences, and the perspective view then exhibits approximate similarity of the parts to the whole, which does not in reality exist.: The facade then possesses harmony when foreshortened, which is wanting in a front view, a phenomenon not infrequently observed.: Vertical divisions are least changed in perspective; ratios of divisions in the height to each other, and their repetition in subordinate members appear most plainly in strongly foreshortened facades.

80. Theory of Similarity.:

Since all objects may appear in perspective, a glance at perspective from the stand-point of the theory of similarity may be in place.: Two general and well known phenomena are important:

- 1.: A uniform series of equal intervals changes into a series of continually decreasing intervals.:
- 2.: Similar objects, repeated beyond each other and similarly located, are geometrically similar forms.:

The beauty of the uniform series is generally based on this property of its perspective appearance, when the divisions are so arranged, that approximately $a : b :: b : c :: c : d$, etc. (Double ratio of New Geometry). All other series, like those in periods or groups, do not possess this beauty; for relations of two successive parts are confused in perspective. Hence monumental art always prefers a series uniformly continued in a straight or curved line. An important part is played in interiors, where these continued equal intervals exist in connection with a repetition of the cross section of the room in continually lessening dimensions. Space effect of a passage between columns, a vaulted hall, or the interior of a church, is more imposing, the further these repetitions of similar figures are continued. It is conceivable that our eyes have become so accustomed to regard equal figures as nearly similar, that even if a figure be repeated at an actually reduced scale, this agreement is at once recognized and an impression of harmony thereby created.

Final Considerations.

81. Proportions in Organic Nature.

When such a law is manifested in diversity of appearance, one must seek its basis. Let us attempt to penetrate further into the mystery. A prominent writer on Esthetics has said: "Sculpture is an imitation of human, and Architecture is an imitation of Plant forms." Inorganic nature supplies geometrical elements, and organic nature affords in plants, especially in the growth of trees, a model or a repetition of the primary form in the individual parts, the law of similarity and proportion. The entire form of the tree reappears in the branch; it even frequently appears in the form of the leaf or of the fruit. This repetition in plants results from growth, the first delicate twigs increasing to boughs and the germ becoming a complete organism. The completed building may be termed an organism. The whole grows out of a typical form and develops into numerous variations.

But another reason for a pleasing effect is based on the activity of the mind and consists in composing an image of the whole from views at different stand-points. The simpler the relation of the parts to each other, and the more frequently they are repeated, the more readily and willingly does the eye follow the lines, and the more easily is the internal intellectual image constructed. Mere similarity of form without variations and contrasts are justly found monotonous and wearisome. This requires this law to be supplemented by contrast, and contrast is to be strengthened by proportion. Contrast without harmony is disturbing and only appears irritating or even ridiculous.

82.: Harmony.:

The esthetic judgement of the eye is satisfied by similarity in variety. Is not the same true of the esthetic judgement of the ear? What is rhyme, on which is based the charm of modern poetry, but a similarity of sound, which cannot become identity, and which pleases even in its complications by its diversity and changes? We recognize rhyme in architecture as well. Similar rules are prescribed for harmony in music. It is everywhere a common conception and expression to designate the beautiful in sound and in form. Harmony in architecture is simply an analogy of the parts to the whole, as stated by Vitruvius. No rule of art compensates for lack of genius. Diligent use of the rhyming dictionary never made a poet; but a poet must carefully observe the rules of rhyme. Thus, knowledge of the law laid down here will never make an architect. But it will aid talent to shorten the course of experiment and to guard it from error. It may be termed a proper limit within which genius must work, in order to produce results that satisfy esthetic feeling and which may be justified to an inquiring mind.

DIVISION III. DESIGN OF THE BUILDING.

By Professor Heinrich Wagner.

83. General.

It was shown in Division I that external form must be based on internal organism of the building, that both may have the most intimate relation to each other. In the primary ideas of the design, they cannot be separated. When the artist represents his idea, he must mentally see the principal lines of the entire structure. With this general image in mind, he makes the drawing board the work shop of his mind, where he sketches in its main lines the design of the building in plan and elevation, afterwards embodying it in the completed project. The floor plans determine the form and the internal subdivision of the building; they supplement the views, elevations, and sections, which exhibit the external and internal architecture, and the construction in part. The preceding Division contains the principles controlling the design of the building, which manifest themselves in the organic arrangement and the connection of its separate parts. The points of view for considering the general design, on which is based its leading features, are now to be stated.

Chapter 1. Data for Design.

84. Programme.

The purpose and importance of the building determine the general and space requirements. These must be first considered, the number of rooms and their dimensions be fixed, and choice made of site for the building. A statement of special local needs and of personal requirements must also precede designing the structure. To these data are added limitations of money for building, frequently the mode of construction and finishing, legal and statutory requirements, etc. All such conditions are usually comprised in a programme and form the primary data of the design.

It is necessary to obtain a clear idea of all points to be considered before commencing. This can very seldom be obtained from the programme alone, which is generally defective, though the success of the work greatly depends upon this. Responsibility for the building always rests on the architect, and he receives the blame if it be a failure. He should therefore endeavor to take part in preparing the programme. But he must obtain clear knowledge of the conditions, so that he may point out disadvantageous things and improve the requirements; he should properly guard himself from consequences to be feared. His resignation will only be tendered when the requirements of the programme cannot at all be harmonized

with a rational design for the structure. Even if the building be primarily adapted to its purpose, it must also be arranged in accordance with the wishes of those who are to occupy or own it. The owner pays for the building, and therefore attention is to be paid to his wishes and decisions. The skill of the experienced architect will usually succeed in properly solving the difficulties in some manner, if his influence be not sufficient to remove them entirely. These factors influencing the programme can be given only for the different kinds of buildings, and then merely according to circumstances. These requirements are as defective if too vague as for them to be too rigidly stated. The assistance of an intelligent architect is therefore indispensable in arranging the program.

85. Space Requirements.

Space requirements of the problem are usually incorrectly fixed. They are often underrated as over estimated. The owner usually lacks judgment even if perfectly acquainted by experience with the needs the building is to fulfil. Persons with little knowledge of the profession may be able to understand a drawing, but only in using the completed building will its faults appear, and the owner then discovers that the rooms are too large or too small, though their number and dimensions were prescribed by him, and that their sequence and arrangement do not correspond to the conditions of the problem, nor to his own expectations and wishes. These requirements are chiefly fixed by the purpose to be served. They further depend on the money available, assuming it to be a good and economical design. Their influence on the programme is therefore of great importance.

86. Site of Building.

Difficulties in the choice of a site are often not properly considered, even if the question of suitability for the purpose be more easily decided than many other conditions. Yet the necessary dimensions are often under-estimated. The duty of an expert is to examine the proposed building site in general and in detail, and in accordance with its location, nature, area and dimensions, to consider the possibility of giving the building a fit location, of enlarging it if required, of obtaining good lighting and free access of air, as well as for fulfilling other needs of the occupants for health, well-being, and comfort. These questions are often of such importance that they decide the choice of site. But for other buildings, the point of view may be of an esthetic nature, requiring from the artistic stand-point that the external architecture may produce a striking, graceful or monumental effect.

Other questions are not technical, concern the suitability of the building, but are only indicated here. First are convenient roads for access to the grounds, connection with streets and waterways, and secondly is the opening of the building to business, to the life and traffic of a great city, making it of as easy access as possible, and thirdly, to separate it far from noise and manufactories, from bustle and disturbances of all kinds.

87. Local Influences.:

First is an examination of the site in reference to its nature, low or high situation, existence of water in the ground and possibility of inundation, which will decide the grade for the building or its lower story, and other precautions to be taken against water and dampness, and the means to be adopted for drainage. Lack of water must often be remedied. In low ground one must beware of marshy earth, of fog and stagnant air, while on hills and on the sea shore, the effects of prevailing winds must be guarded against. The possibility of a sinking of the earth and of earthquakes must also be considered.

88. Place and Aspect of Building.:

Location and aspect of the structure partly depend on these, partly on the outlook and surroundings, as well as on orientation for the building or some of its parts. This point will be fully treated for certain kinds of buildings, but is here mentioned in general. An eastern or southeastern outlook is most favorable, just as western and southwestern exposures are unsuitable. To directly southern outlook, although generally healthy, it is objected that during summer one must suffer from heat of the sun, while directly northern exposure is to be avoided for lack of sunshine, though sometimes desirable. The nature and form of the site, course of streets and adjacent buildings, and other local conditions usually prevent the location of the building as otherwise preferable. Even where one has a free hand, it would often be best to take into account various preferences and considerations by not facing the building exactly to the chief points of the compass, but making such deviation as to make climatic influences less prominent.

89. Artistic Treatment.:

The degree of artistic treatment to be given to external appearance and to internal finish of the building depends on its purpose and rank, then upon the many at command. For the first, the principles of treatment in Division I must direct and guide. Consideration of what is most suitable and effective for works of monumental architecture, for ecclesiastical or secular purposes, or for merely useful buildings for public or private

purposes, must be left to the judgement and imagination of the architect. Directions of this kind, afterwards usually included in the programme, may be stated only in a very general way with reference to money available, and serve as an approximate limit for the amount of artistic treatment. That design will be best, which produces most with the smallest cost.

If available funds are limited, one shall not cramp the space of the building, but rather limit architectural treatment by avoiding everything unusual. Customary local ideas are almost invariably cheapest. Therefore the building material in the vicinity, so far as suitable for the building, is generally preferable, and it was already stated in Division I that skilful use of this building material and a truthful treatment of it produces a better and more beautiful effect than a more lavish expenditure of costly material without real artistic knowledge. Therefore, even where funds are amply provided, and where one has the good fortune to be intrusted with a work of monumental architecture, it would be well to exercise wise moderation and to be mindful of the principle, that richness must be joined with simplicity, light with shade, animation with repose, and that where the heart rejoices must be not magnificence, but harmony.

90. Fixing Cost of Building.

The chief factors that fix expenditure are the volume of space required and the degree of artistic treatment. These appear clearly in the design and afterwards in the estimate of cost. In order to first compute the sum required for the building, buildings of similar kind and execution, recently erected under like circumstances, may be taken as a basis, and assuming equal heights from these may be deduced the unit of cost per square foot of ground area of the building, or the cost of a building of one, two or more stories; or more correctly, the cost per cubic foot of the total volume of the building may be similarly found. It is not so much the ground area covered by the building, but rather the area that may be utilized for the special purpose of the building, after deducting walls, passages, stairways, etc., that should be made the basis of the unit price for comparing the cost of buildings. This comparison has been made for buildings of the same kind and we find a very considerable difference in cost per square or cubic foot of useful space to occur, according to whether the arrangement of plan of the building is more or less good and compact, independently of other conditions affecting the cost.

But it should not be understood that dimensions of important and necessary ante rooms and corridors or thickness of walls should be reduced;

the former are so increased in many forms of ground plans for buildings as to inconvenience communication in the building, without producing the effect of space, to be attained by their simple and centralized arrangement. This also gradually causes greater extension of the facade and frequently projecting architectural masses which increase the cost. The increase here mentioned is often greater than that for better development in form and richer architectural subdivision of the structure. Much ado is made about the latter, because external and therefore visible to everyone. Nothing is said of waste in arrangement and connection of rooms and of parts of the building, this defect being connected with the inner organism and therefore not apparent. These points will be considered by basing cost of the building on the unit of useful space as indicated. The same end may be simply attained in many cases by computing the unit price according to number of persons accommodated in the building, as in churches, schools, hospitals, etc., by computing the cost per sitting, per bed, etc. This method may also be employed for other units of use.

91. Calculation of Cost.

But a more accurate statement of cost of the building, with a possibility of increase or reduction, is by the careful calculation of cost after the design has been completed. Nothing has so often brought the architectural profession into such discredit with the public as exceeding the estimated cost of the building. This has produced the result that architectural works usually taken from the architect and transferred to contractors, sometimes for a lump sum, or by measurement at fixed prices. The owner believes that the cost of preparing the design will be saved, that of supervision by the architect during erection, and that he will also have security against any excess in cost. Yet this is generally caused by the owner himself, either because he forms correct ideas only during the construction, changes his views, and permits changes from the original plans; or seized by a love of building, he allows enlargements, better construction, or greater richness of external or internal architecture, than had been expected. When he comes to payment and final settlement, he is dissatisfied, and all blame is thrown upon the architect. The latter should therefore be careful, when changes are made, to protect himself in good time against reproach for exceeding cost and from damages for his responsibility, by repeatedly and in writing notifying the owner of the additional cost for these changes from the original design.

The architectural profession in Germany here finds itself in a more difficult position than in other countries. Nowhere else are its duties so onerous or the demands of its responsibility so great, and yet nowhere

else is its position so uncertain, its influence so limited. This is partly due to two things, connected with the usual method of estimating and contracting:-

1. The German architect is generally required to compute the quantities and the estimate of cost of the building, required before letting the work to the contractor.

2. The architect and contractor are usually the same person, an academically trained architect becoming a contractor, or an artistically gifted contractor being also a practicing architect.

The first case may have results of a most serious kind, as shown by cases in which architects have become actually liable by exceeding their preliminary estimates. If the custom is once established for the architect to prepare the estimate of the cost, a moral duty is laid on him to keep within it, and he must lessen the risk by taking the execution into his own hands. It is certainly true that the confidential relation then ends, which the architect should have as professional agent of the owner, and for the good of the entire profession this is most strongly to be deplored.

The position of the architect becomes perfectly clear and independent, and his authority greater and more important, if he does prepare the quantities and the estimate of the cost as is the case in England and partly in France. In England the first is made by the architectural surveyor, the last being prepared by the builder; similar functions being performed in France by the architecte-verificateur and the entrepreneur. As their basis and for letting the contract, in England, a specification or accurate description of the work is added to the plans and prepared by the architect, who has to see that this is strictly carried out during his supervision of the work. His duties are otherwise the same, but his services are exclusively devoted to his employer. The functions of the contractor and of the architect are not united, being considered incompatible with the authority of the architect. Interest in any building contract is condemned in the strongest manner by the entire architectural profession, and preparation of the quantities by the architect or his partners is objected to, at least in cities.

No prospect now exists in Germany, that we may attain to the fortunate position of our English colleagues. Yet they are just as strictly held to their specifications and to the contract, as we are to our estimate of cost. Variations from drawings are never to be entirely avoided; for in new buildings, and even more in alterations of buildings, unforeseen things occur; improvements are suggested, not to be rejected without de-

triment, and every such change causes an increase of cost. It is therefore advisable to suggest to the owner to reserve a certain amount therefor, about ten per cent of the cost of the building, independent of any addition to the estimate.

Within limits fixed in this way, it is possible to keep within the estimated cost, excepting under very unusual conditions. Even with the present system of estimating, this will result in assuring to the architectural profession its just claim to make the design and supervise the construction, but will also furnish a systematic and fixed basis for its natural position as confidential agent of the owner. Its importance in the state and community would thereby be increased, and its independence become indisputable. The owner would recognize that he would always do better to entrust his building to a skilful and experienced architect, than to transfer it to the master builder. He would understand that the work would thereby gain in design and artistic treatment and in execution, by the architect's supervision of the materials and workmanship, as well as security against claims for extras. These advantages and the security of the owner, who knows that his interests are assured, abundantly compensate for commission paid to the architect.

Chapter 2. Treatment of Rooms.

92. General.

To produce an enclosed room is generally the aim in erecting a building. We therefore commence with the single room as the simplest form of the building. This is also to be regarded as the cell of the architectural organism, as the element which forms a basis for the shape of the building. The use of the room and of the building are not here considered, but only its architectural form, as it appears in the design. The room is partly formed by space-enclosing and partly by space-dividing structural parts. The space-enclosing parts are the roof and the external walls, the space-dividing parts being the floor and ceiling, the division and middle walls, the latter usually parallel to the principal external wall, to which the former are generally perpendicular. Floors and ceilings subdivide the building into different stories.

This frequently requires a space to be merely enclosed, or sometimes covered, otherwise being as open as possible; sometimes a hall must be of such extent that ceiling and roof require intermediate supports between its walls, such as isolated pillars, piers or columns. Colonnades or arcades are also employed to subdivide space. The ceiling, roof, and walls are seldom unbroken; for a connection with the exterior or with rooms above or below, openings are arranged, generally so that they can be clos-

ed as desired. We have to treat of these parts of the building only so far as upon their respective places and locations may depend the treatment of the space and the treatment of the building.

a. The Room.

83. Its General Form.

In the treatment of the room, we have first to consider its form in general, with reference to factors influencing this, and whether it is to be considered as an isolated or a space-forming element of the building. This form primarily depends on the intended use of the room, then on the possibility of easily combining it with rooms of similar form with due regard to shape of the building, and lastly upon the money available and on the results of its shape.

84. The Elementary Form.

The rectangular form possesses most advantages in all respects. Regarded from a purely mathematical standpoint, the circle among all figures, and the square among all rectangular figures, are those most compact, or those requiring least wall surface to enclose a given area. This advantage is only theoretical, since disadvantages generally result and neutralize it. The perimeter of the circle is about 11 per cent less than that of the square, therefore materially less. But circular rooms cannot be directly connected. The construction and the details of windows and doors are less simple; all furniture and furnishing must be made to order at increased cost. With a large radius, these difficulties are lessened or removed by the slight curvature, but with a small radius, they are increased and the circular type of plan is exceptional for small rooms. The approximate form of a regular polygon also has many difficulties in combination and construction on account of numerous angles and deflections.

The rectangle makes everything more simple and natural in construction and arrangement; it is therefore the usual and preferred elementary form of a room as a building unit or separate element of the building. (Fig. 83). Oblique angled rooms cannot be avoided when the site is of irregular form, and if variation from the rectangle be not great, it then becomes scarcely noticeable (Fig. 84). It sometimes occurs that even with rectangular ground plan, as on sites at angles of streets, it is permissible to arrange the plan about an axis oblique to the external walls, changing a rectangular room into one partially oblique (Fig. 85). To transform a slightly oblique room into a rectangular one, if the irregularity must not appear, the solution in Figs. 86 and 87 may serve; but such arrangements are not applicable to ordinary plans on account of the considerable expense thereby incurred. If the variation from the right angle

be considerable, the obliquity is to be limited as far as possible to subordinate rooms, or by interposing suitable forms, a regular and pleasing treatment may be obtained (Figs. 98 to 101).

It is still to be considered, when the square is to be preferred to the rectangle. Economy of wall surface will not decide, for if the rectangle does not differ very much from a square, the saving will be slight, scarcely 1 per cent difference for a rectangle having proportions of 3 to 4.

Therefore difficulties in the design of the ground plan are not created, where advantages do not result, everything being taken into consideration. The square form will be preferred, for a tower, (Fig. 102), where no reason exists for giving to room different dimensions on transverse and on principal axes, but suggesting the same treatment in both directions. Figs. 103, 104 are examples. In these and many other cases, the regular polygon or circle is preferred, or ground forms composed of portions of these figures, whether intended for special purposes, as for audience rooms of theatres, circus buildings, etc., for a centrally located room, or for one emphasized in some other way on the plan, or for convenient use of an acute or obtuse angle, an angular and unsymmetrical portion of the plan is actually preferable. The elliptical form is exceptionally found and may be replaced by an approximate figure composed of arcs of circles, or of one extended by straight lines.

The arrangements first described are represented in Figs. 105 to 109. By Figs. 105 and 106 an idea of the external appearance will easily be formed, creating a conviction that by solutions derived from the most important conditions of the problem, a characteristic effect may be obtained, a transition pleasing to the eye, and a combination of the masses of the building and of the members, which would otherwise be awkwardly connected together. Figs. 107 to 109 exhibit rooms enclosed by arcs of circles.

95. Extension of Rooms.

For extension of rooms or annexes, apses, galleries, exedra, angle bays, balconies, loggias, porticoes, grottoes, etc., which must be considered as accessories and always have a special purpose, another type of form is quite appropriate, as in Figs. 110 to 117, whose effect is increased by contrast with the ordinary form. But for simple and frequently repeated rooms, the use of unusual forms is unjustifiable. These should not owe their origin to mere whim or a desire of notoriety. Therefore the fanciful ground forms so commonly employed in the last century (amusement buildings, villas, etc.) should not be imitated, however skilfully they may be combined.

86. Forms of Ceiling.

The form of ceiling depends on its treatment, and the following cases are especially to be distinguished.

1. The roof at the same time forms the ceiling of the rooms; it is then space-enclosing or may be space-dividing, when an upper room exists.

2. The ceiling extends free over the entire room, or intermediate supports may be arranged between the walls.

To these two motives, and the method of construction connected therewith, are to be referred the most varied forms of ceilings, which partly assume plane or curved forms, are partly inclined with uniform or broken slope, or partly of simple or compound form. It is unnecessary to discuss them further, since they seldom occur except in rooms of especial importance.

(Div. 5). For ordinary rooms or simple elements of the building, the horizontal form of ceiling is most natural. It will therefore be taken as a basis, and the rectangular form of room be fixed upon as the leading one, both in section and in plan. The dimensions of the room, its length, depth, and height, are first determined in accordance with the purpose and importance of the building, afterwards according to its construction and the location of windows, doors, etc., opening out of the room.

87. Length: Distance between axes of Windows.

The length of the room is fixed in accordance with the number of windows to be placed in the external wall and according to distances between their vertical axes. The latter varies with the scale assigned to the building. The more important the structure, the greater is the distance between these axes. Buildings for utility or simple dwellings, especially buildings with small rooms and numerous division walls, naturally have small distances between these axes, while monumental structures frequently have very great distances between them. From 6.26 to 8.20 ft. may be given as least distance between axes of windows, 8.20 to 11.48 ft. an average, and 22.92 to 26.24 ft. being the greatest. The distance between axes indeed very seldom falls outside these limits, it not being advisable to assume a greater scale for the building and a greater distance between axes of the windows than the purpose of the building would justify. The lighting of the room would sometimes be injured thereby. But it would certainly be very bad to make distances between windows too small, for the necessary repose in the internal and external appearance of the building would be lacking; the subdivisions would be too small, the relief too weak, and the general effect not imposing. The given average distance of 8.20 to 11.47 ft. will therefore be exceeded in important private residences, and especially in many public buildings, on account of their purpose. (See Table).

But if definite reasons permit the arrangement of windows and other openings close together, it is then advisable to combine them in pairs or groups, thereby obtaining large axial distances and more imposing effect. Whether the room has one, two, or more windows in front, depends on whether its average length is one, two or more times the axial distance between windows, less the thickness of division wall. The pier between the windows is the place for the location of the division wall, which need not be exactly at the centre of the pier. Less than the half is often sufficient at one side of the window and more is often necessary. (Figs. 119 to 120.).

98. Depth: Position of Doors.

The depth is the most important dimension of the room; other dimensions are to be arranged in accordance therewith, and in designing the building, we therefore commence with the depth of the room, selecting the form of ceiling to suit this. The depth itself depends on the possibility of good lighting by day. If the ceiling be suspended from the framework of the roof, or rests on girders, isolated columns, division walls, etc., spaced at such distances as to require no support between them, then may depth be taken at pleasure, provided that sufficient natural lighting is also obtained. In rooms of unusual depth (Div. 5, Chap. 4), one of the indicated methods of construction must be employed to secure the required depth; but for rooms of unusual size, the simplest construction is to arrange the ceiling so as to be free between the walls. It generally rests on the external and middle walls, and the depth of the room is then naturally limited. Even with iron beams, the depth can scarcely be made more than 24.6 to 26.2 ft. without using girders, or seldom over 21.3 to 23.0 ft. with wooden beams, generally having an average depth of 18.4 to 19.7 ft. This is sufficient for most purposes; less depth frequently suffices, and only in buildings with large rooms will more be required. The latter require sufficient clear height of the room, if the lighting only occurs along its longer side.

But the depth is primarily fixed by the use of the room, which demands available wall surfaces of a certain length. Therefore, if economy requires the least possible depth of room, we may decide on the possibility of so placing the connecting doors of the rooms in the division walls, that the required wall surface exists at both sides. For most purposes it is sufficient, beside the door from 2.56 to 3.89 feet remain to receive larger furniture, with from 3.26 to 3.61 ft. at the other for smaller pieces. According to whether a single or double door is employed, for which with architrave from 4.28 to 5.90 ft. is to be allowed, there results a depth

or 14.75 ft.: as in Fig.: 118, or 16.40 ft.: as in Fig.: 119. Whether the door is set near front or rear wall depends on which portion of the division wall is to be best lighted in the day time. Custom influences this, but if the door is set in the middle of the wall, as in Fig. 120, a depth of 18.00 to 19.70 ft.: is required. The arrangement of heating apparatus is important for the wall surfaces. The preceding figures are based on given average dimensions. Yet they permit reduction if necessary. The depth is but rarely fixed for a single room, since a series of rooms generally have the same average depth.

99. Height: Arrangement of Windows.

This is true for the height of the room, since the stories extend through horizontally, a break in this arrangement being only occasionally found. Height of stories has remained constant for centuries in buildings of the same kind, and may within certain limits be considered as fixed. Like dimensions of rooms, the doors, windows, etc., are in detail fixed by the height of man, otherwise by the mode of use. Heights of stories of ordinary buildings are seldom less than 8.20 to 9.84 ft.: or more than 11.48 to 13.10 ft.: But for buildings of monumental character, the lower or upper limits may scarcely be given; yet heights of 19.70 to 26.20 ft.: are not at all unusual in places (See Table)

But buildings for purposes of mere utility frequently require heights exceeding the usual ones. For their dimensions, one must chiefly judge by size of room, especially by its depth, and it must be made higher, the deeper it is, so that parts most distant from windows may be well lighted; this will be more effective, the higher the top of window, whether window sill be somewhat higher or lower; for the latter is only decided by the use of the space next to the window. Therefore in deep rooms to be well lighted, the window should extend as close to the ceiling as possible (Fig.: 121). This causes difficulty if the beams are perpendicular to the front wall. Such high locations for windows also appear inadvisable for most buildings; some wall space is required above lintel or top of window opening to receive curtains, blinds, etc., for reducing the light. This produces the usual arrangement in Fig.: 122.

It is permissible in case of necessity to break the levels of the stories on account of certain rooms, which must have greater height. This may be done in either of three ways:

1. By dropping the floor, the room then usually being in the ground story or above subordinate rooms (Fig.: 123).

2. By raising the ceiling, above which the roof is directly placed, so that the height of the roof can be entirely or partly utilized. (Fig.

(124).

3. By extending the room through two stories, whose total height is required. (Fig. 125).

It must always be remembered, that these arrangements must not make the construction much more difficult, nor may passage within the building be impeded.

100. Proportions.

In determining the height of such unusual rooms, a factor of importance in esthetic relations is to be considered, which may be neglected for rooms of ordinary dimensions arranged in continuous stories. This comprises proportion of its interior, or the ratio of its dimensions. For determining these, the point of view of the observer in the room itself is decisive, even more than for the exterior. The following data may serve as approximate rules, where length and depth are to be taken between the points of support of the ceiling, and height is measured between floor and ceiling.

According to old and well known rules:-

1. Height = $2/3$ to $3/4$ the depth.
2. Height = $1/3$ (length + depth)
3. Height = $1/2$ (diagonal of rectangle of length and depth).

According to Durand:-

4. For horizontal ceilings:-

Height = depth, if length exceeds depth.

Height less than depth for square, polygonal or circular rooms.

5. For vaulted ceilings:-

Height = $1/2$ times depth, if length exceeds depth.

Height = depth for square, polygonal or circular rooms.

But these rules will be so modified for rooms of unusual size that the height may be so much less than the depth, the greater the absolute dimensions.

According to Fergusson:-

6. Height = $1/2$ depth + square root of length.

The first rule makes the height depend upon the depth and is very arbitrary; rules 2, 3, 4, and 5 are frequently inapplicable. In the last two, Durand has correctly recognized that the height of the room is not alone to be brought into relation with its length and depth, but also into harmony with the form of the floor and ceiling. Yet he proceeds arbitrarily, when he makes the height of the room equal to its depth, or to one and half times the depth. Fergusson's rule gives rather inadequate height for small rooms with length and breadth less than 16.4 ft., but very suit-

able height for large rooms. If several large rooms occur in a story, a suitable average height is to be assumed. When these are of sufficient importance, subordinate smaller rooms may be arranged in two stories by inserting an intermediate floor.

Dimensions of rooms are also determined in accordance with space required for their purpose, generally being calculated for the number of persons assumed therein. These details are referred to the discussion of the different kinds of buildings, and for the usual dimensions of doors, windows, etc., see Part III of this Handbuch. A collection is added of axial distances, depths and heights of rooms, taken from a number of the most important buildings, mostly recent. The absolute dimensions are in many cases fixed by the uses of the room, but in other cases are influenced by the rank and importance of the building. As an example of the earlier period for comparison only, is added the Loggia dei Lanzi at Florence, built about the middle of 14th century, which is perhaps unsurpassed in beauty and grandeur of proportions.

TABLE OF BUILDINGS.

A. = distance between vertical axes of windows in feet.

D. = Depth of room in feet.

H. = clear height of story in feet.

Kind of Building.	A.	D.	H.		Notes.
			1st.	2nd.	
School, Munich	5.25	23.1	12.5	13.5	5 lg. windows per room. double seats.
Farm buildings, Frankfurt	5.90	12.5	8.2	----	A. = width of stall
Res. of H. Fischer, Vienna,	6.56	19.7	12.5	13.8	3 W-ns combined.
Res. of H. Wahnert, Aix-la-Ch.	7.55	20.1	14.2	11.7	
Prison, Plotz, Berlin	8.20	13.1	10.8	10.8	A. = width of cell
Central Hotel, Berlin	9.35	19.7	17.4	14.0	Front, Friedrich St.
Assem. Bldg., Neustadt	9.86	29.5	19.7		A. = unit of bldg.
Post Office, Stettin.	9.86	19.7	15.4	15.4	
Verein Bank, Stuttgardt.	9.86	20.4	14.1	15.4	Simple & richer windows alternate at 2 A.
Building School, "	11.0	23.3	14.4	14.4	A. to 2 Brg. Tables.
Frank. Hotel, Frankft.	11.20	24.2	19.7	13.2	Central portion.
Main Bldg., Univ. Strasburg.	11.20	46.6	19.4	31.8	Ent. hall & main hall.
Court House, Stuttgardt,	11.30	21.5	13.4	15.2	Main front.
Theatre, Riga.	11.50	29.9	13.8	18.4	Ent. hall & foyer.
Polytech., Berlin, M. Bldg.	11.80	27.9	19.6	20.5	A. = 10 small or 8 large seats.
Stad. Art. Inst., Frankfort	12.30	14.8	19.7	16.4	A. = width of rooms.

ARCHITECTURAL COMPOSITION.

Kind of Building.:	A.	D.	H.		Notes.
			1st.	2nd.	
Chem. Inst., Univ. Vienna	12.50	23.0	17.8	19.7	A. = 2 working ples.
Rathaus, Vienna	12.50	25.0	14.5	23.6	A. = unit of bldg.
Govt. Bldg., Dantzig	13.15	21.0	16.1	31.2	Central Building.
Abatt. & Market Budapesth	13.40	25.0	11.2	----	A. = 4 stalls.
Library, Univ. Of Halle	13.80	26.0	14.1	14.1	A. = 2 book stacks 2 tiers to story.
Gen. Hospital, Berlin	14.00	29.9	17.4	21.4	A. = 2 beds.
Anhalt R.R. Sta., Berlin	14.40	44.3	----	29.5	Waiting room.
Harmonic Society, Heilbrau	14.80	18.1	14.8	18.4	
Vict. Storehouse, Berlin	15.30	30.8	9.2	8.9	
Royal Villa, Berg.	15.80	25.0		19.7	N. front.
Castle Hummelshain, Jena.	16.4	32.8		16.4	Main front
Meininger Bauk., Berlin	16.6	18.4	15.6	16.1	Double windows.
Barracks, Lubeck.	16.8	30.5	11.0	11.0	A. = room for 10 men.
Abattoir, Berlin	17.1	30.8	20.7	----	A. = 1 place.
Theatre, Berlin.	17.2	45.4	15.4	44.3	Concert hall 2 story.
Bourse, Vienna	17.8	36.7	29.5	46.0	Ent. hall & hall on main front.
State Library, Stuttgart.	17.8	59.0	16.4	32.5	A. = 2 bookcases; 4 tiers in up. story.
Spinn Block, Berlin	18.4	18.7	15.1	14.4	For 1st & 2nd stories.
Wohler School, Frankfort	19.7	36.1	17.1	32.8	Grouped windows abv. Ent. hall & main hall.
K.W. Gymnasium, Berlin	20.0	20.5	14.4	14.4	A. = 1 schoolroom with double window.
Borsig Palace, Berlin.	20.4	20.7		23.3	Voss St. front.
Res. Thonet, Vienna.	21.4	39.4	16.4	14.4	1st & basement stor- ies together: A. = 2 windows in 2nd story.
Polytechnikum, Zurich.	23.6	36.1	26.6	29.5	Central portion:- A. = 2 windows in basement.
Pal. Reichstag, Berlin	26.3	42.7	21.4	38.5	Main facade, centre.
Art. Ind. Museum, Berlin	27.8	26.3	20.7	24.0	Grouped windows.
Main 4.4. St. Frankfort	29.9	180.0		78.8	Central Building.
Museum, Arsenal, Vienna	35.5	39.4	24.3	36.5	A. = 1 stand of arms.
Loggia d'Lenzi, Florence	38.5	35.8		72.7	Total height.

b. Lighting of Rooms.

101. Natural Lighting.

Natural Lighting by sun light will be treated here, and is introduced through openings in the walls, ceiling, or roof. These either open di-

rectly into the open air or into a well lighted room above or at one side. Direct light is obtained in the first case, borrowed in the others. Still especially in side light, a distinction must be made between that from the entirely unlimited exterior and that from a limited space, streets or courts, enclosed by adjacent buildings, light then being partly reflected. These openings are also means of ventilation, which then occurs in the most rapid and natural manner; in our climate they seldom remain open, but are mostly closed by sash windows, or by glazed skylights in ceilings or roofs. Glazed doors also sometimes light a room. It is only necessary to mention these arrangements, so far as their location in wall or ceiling and the required area of light surface for the room are concerned. Quality of light depends upon the mode of lighting:-

1. Whether low or high side light or ceiling light is provided.
2. Whether this is direct or borrowed, side or ceiling light.

The climate, season of year, location and surroundings, also influence intensity of light.

102. Glass Area.

In determining the glass area, these factors are to be considered; the use of the room is of great importance, and it is to be remembered that intensity of light diminishes inversely as the square of the distance increases. Since light is broken and diminished by glass, the window is to be considered as a source of light, and the distance is to be taken from it. All these are to be taken into account in given cases, and the light area determined accordingly. Requirements based on the use of the room will be mentioned in successive volumes of this Handbuch under different kinds of buildings, such as school houses, exhibition buildings, museums, etc. Reliable methods for determining quantity of light introduced through windows into any given room, will be given in other volumes of this Handbuch. These processes chiefly consist by means of solid angle measurer, in measuring the pyramid of light directly radiated to any point in the room to be examined.

The general rules are unsafe and inaccurate, such as that for lighting rooms of ordinary height, $1/7$ to $1/5$ of the floor area is to be taken as the glass area, and that the top of the window must be at a height above floor equal $2/3$ the depth of room, etc. For openings may thereby be fixed, which may sometimes introduce insufficient light, or may supply more light than is necessary. The latter results much more frequently than the former, using the ratio of $1/7$ to $1/5$, and a window opening fixed by this rule often produces such abundant lighting of the room, that this light must be at times obscured by curtains, shutters, etc. This is true for

both side lights and skylights; if the former are more frequently limited by surroundings than the latter, then is the light from the latter so much the less intense, being usually received through the roof, at a greater distance from the floor, generally through two thicknesses of glass. Reflected light is especially unsuitable and disturbing and should therefore be avoided.

103. Direct and Indirect Lighting.

Only rooms receiving direct light can usually be said to be well lighted. Windows are used for this purpose, and their lintels or tops are placed as high as possible, according to Art. 99. The rectangular window is most suitable, admitting more light than any other form of equal width and height. Height of sill window is fixed according to use of the room. The usual height of 2.42 to 2.62 ft. is especially applicable to living rooms, and is such that one can conveniently open the window and look out. In many cases (schools, prisons, etc.) both of these are not intended, but merely to light the room, and such a low sill would not be advisable. The sill is then higher, in many cases above the head as in halls, to afford protection from draughts through crevices of windows. (Fig. 130). Borrowed light should be employed only in subordinate rooms and when unavoidable, but only with care and so as to make ventilation by the openings possible. Therefore windows should be arranged in addition to skylights, or at least air flues should be provided.

104. High Side Light and Ceiling Light.

High side light especially occurs in rooms of great depth, and in those of such great height that windows are placed above roofs of adjoining rooms (Fig. 126). Notable examples of these are domed structures and basilican designs (Figs. 127, 129). Rooms of very great depth require for good lighting windows along both long sides as well as along the ends. Yet one should avoid placing windows where unnecessary. Ceiling light is frequently arranged, though improperly, with entire exclusion of side light. Both often influence the form of the ceiling (Figs. 128, 130). Direct ceiling light can only be obtained in a room located in the upper story; yet it may also sometimes be utilized in lower rooms, as in Fig. 128. The value of ceiling light in comparison with that of high side light is explained by Boileau in Figs. 131, 132. These illustrations exhibit both modes of lighting arranged in the same room, for example, in a hall 32.8 ft. wide with side rooms 18 ft. wide extending along the long sides, with two stories of galleries above. These side rooms receive light only from the opening in the ceiling, or from side openings in upper wall of hall. For points O, L, I, F, of the floor, the number of light rays falling on

each are found for a cross section plane through the central angle in both cases. These give the following results.

Fig. 131.

For point F	47 degrees.
" I	42 "
" L	28 "
" O	9 1/2 "
" E	0 "

Fig. 132.

13 1/2 (9 + 4 1/2) degrees.
11 1/8 (11 + 1/2) "
10 1/2 degrees.
9 1/2 "
0 "

If these values are laid off as ordinates on the axis of abscissas, E, O, L, I, F, the areas of the hatched surfaces given in the two illustrations represent the relative quantity of light, which for an assumed distance of 2.56 ft. between the points, are in the proportion of 202 in Fig. 131 to 78.5 in Fig. 132. The number of light rays be similarly determined for points in the two galleries. The length of light openings is neglected in both cases. For complete comparison, this must be taken into account, i.e. there must not alone be measured a section plane through the opening for light, but the volume of the entire pyramid of rays, whose base is the light opening, and whose vertex is the given point, as well as the inclination of the resultant of the light rays. This may be done with the solid-angle-measurer already mentioned.

The light reflected from all sides will be introduced into those parts of the room that receive no direct light (vertically hatched in Figs. 131, 132). It is to be ascribed to this, that high side light and omission of ceiling light as in Fig. 132 affords a light less bright, but much milder and more uniform than ceiling light, which has a very dazzling and disturbing effect. Fig. 132 is an example taken from a Vienna building with the arrangement in Fig. 131. A kind of high side light and very effective is afforded by saw-tooth or shed roofs. The glass area should then be turned to the north.

The lighting of rooms located in the intersection of two parts of the building is generally difficult. It is either by a ceiling light as in Fig. 133, or large side light windows are arranged at one end of the room as in Figs. 134, 135. Or the room may be lighted like the so-called "Berlin" room. Direct sun light is then usually introduced obliquely as in Fig. 142). For indirect lighting inside rooms, light courts or light shafts are frequently arranged, enclosed in the building and receiving direct light from above. These generally have a single or double glass roof (Fig. 136). By their enclosed location and high roofs ventilation is obstructed, light is not uniformly diffused, and the side walls are brightly lighted; but the glass or area should not be too small, not less

than 21.5 to 53.7 sq. ft. for light shaft, or 107.5 sq. ft. for light court. The ordinary "area" in English houses in blocks has many advantages, and is also an effective protection against penetration of dampness horizontally. This kind of light court, like that in Fig. 137 is frequently employed. Low lying cellars must often be lighted by small light shafts constructed in the masonry opening in the surface next the court or street being properly covered and protected (Figs. 138, 139).

105. Artificial Lighting.

The artificial lighting of rooms and location of lighting fixtures do not exert as much influence on the plan of a room as the natural mode. The removal of gases of combustion from lighting fixtures arises, and if these are also to serve for ventilation, this factor may within limits determine the treatment of the room. How this may influence the form of the ceiling and of halls will be shown in the last chapter of this volume.

c. Arrangement of Chimneys and Heating Apparatus.

106. Chimney Flues.

The choice of heating system and arrangement of heating apparatus are of great importance, both for room and for the building to which it belongs. We only mention apparatus for local heating, such as stoves, fire-places, etc. connected with these are the flues, in regard to which it is to be noted, that they should be placed in the rear portion of the room and in the interior of the building, preferably in middle walls supporting beams in Germany and Austria, in division walls in France and England. In the last case, every other division wall is made thick enough to receive the flues, but frequently only the middle wall in the first case. According to arrangement of walls and beams and to the weakening of masonry by openings, numerous exceptions from the rules occur in both cases. Both methods are required partly by different construction, partly by nature of the heating apparatus. The flue is objectionable when it projects from thin walls. External walls are least suited to receive flues, partly from their less protected situation, partly for the great height to which they must rise free above the roof to a point higher than the ridge. In simple buildings with flat roofs, this objectionable feature will be very visible, while on rich facades with steep roofs and gables, the chimney caps may be effectively employed as motives for artistic treatment of the external architecture.

107. Heating Apparatus.

Otherwise flues are to be arranged according to location of stove or fire-place, this being fixed according to the uses of the room. This raises the question of kind of heating apparatus, and whether it is to be sel-

exted with sole reference to heating the room, or with regard to pleasing appearance. In the first case, the stove is so placed as to interfere least with use of the room, but in the second, it takes a prominent position as an ornamental object of internal decoration.

The fireplace with open fire is a luxury, common in France and England but in Germany it occurs only in sumptuous buildings, then being usually combined with a central heating system. It is a very effective element in the decoration of walls, and is therefore arranged on the axis of a room, where it occupies slight depth but considerable width in rich designs. Its chief charm is the open fire and hearth, around which persons gather for cosy, quiet and intimate conversation, so that in social and family rooms it is best placed at the centre of a long wall (Fig. 140) or against a broad pier. In French plans it is often placed in a window recess. For rooms of societies and larger halls, a location between two doors is effective, as in Fig. 141, the opening above chimney breast being closed by a mirror or plate glass affording an effective view into the adjacent room.

The tile stove has been so perfected in form and color recently, that as an object for effect it is scarcely inferior to the fireplace, even sometimes surpassing that. Even if arranged with an open fire, it is seldom placed at the middle of a long wall, as it projects much into the room, space around the stove is not comfortable and furniture cannot be placed near the stove. In accordance with the location of the flue, the best place for it is in one of the rear angles next the middle wall, as in Figs. 142, 143, or beside a door, where sufficient width exists. The use of the room decides the location of the usual terra cotta and iron stoves; it also locates the wall-stoves, which extend through the wall, as in Fig. 144, and heat two adjacent rooms. Stoves heated from the exterior were formerly common, but are no longer used and their great projection is thus avoided.

To avoid discomforts resulting from isolated heating, the fully developed central heating systems afford means. Without discussing location of radiators in separate and central heating, or the arrangement of openings for admission and removal of air, it may be briefly said that these are to be suited to the decoration of wall surfaces, and that due regard must be paid to the selected system of warming in the design.

Chapter 3. Forms of Buildings.

108. General.

Without reference to its purpose, the erection of a building is in a general way the creation of an enclosed space. A building usually consists

of several rooms, serving for different purposes (Div. I, Chap. 1-9-12), arranged suitably beside and above each other. The last produces buildings of one or more stories, and according to their location, the cellars, basement, lower, ground, upper, and attic stories are distinguished, as well as intermediate or mezzanine stories.

109. Buildings without Internal Rooms.

The enclosure of space is not always the purpose of the building. For many buildings possess no internal rooms at all, or are without internal effect. Here partly belong those highly important works in ornamental architecture, which only serve an ideal purpose, embody a spontaneous idea of mankind, and are therefore erected as monuments in honor of the Deity, or in memory of notable events and persons. Isolated portals and gates belong here, as well as certain objects transferred to architecture, like fountains, wells, candelabra, vases, etc., which by nature and origin belong to other technical arts, and those pertaining to landscape gardening. But since external form is both beginning and end of this problem, and the design and arrangement of the building according to the views of esthetics, this is not the place to further consider them.

The following articles will treat only of the building in the usual meaning of the word, and as being produced by combination of separate space-forming parts. Progressing from simple to compound, and commencing with the ground plan of the building as a proper basis of the design, the exterior will only be regarded in its chief outlines.

a. Buildings of Simple Form.

110. Buildings containing a single room.

The building of the simplest type contains a single room, undivided in plan and elevation. Arts. 94 to 98 on forms of rooms in general apply here; but one is not restricted in choice of form of plan and ceiling, dimensions, etc., by consideration of adjoining rooms and parts of the building, and so far as the problem permits, may retain the artistic point of view. Simple and regular type forms are especially suitable here. These unpretentious structures frequently receive richer treatment. The type form receives extensions as in Figs. 110 to 115, and there appear modified as ante rooms. The problem often affords opportunity for use of rows of piers or columns, or of other space-dividing structural parts; a transformation upwards of the type form may often be observed, both in the interior and in the exterior of the building. It is generally furnished with a base or substructure, whose height is compensated by arranging steps.

In the external appearance of the building appears a free development of the architectural design, and if simple, especially in the form of roof;

for this directly indicates the type form. The form of ceiling is also of decided importance to the internal treatment, both in construction and form, and according to Art. 98, this may either freely span the room or require other supports between the walls. According to both methods, the structural system of the roof preferably approximates the form of treatment of ceiling of the room; but the latter is often entirely independent of the former. Both are influenced by arrangement and distances between points of support. These buildings, partly of very limited, and partly of very imposing dimensions, have in all ages been most extensively used in architecture as temples, chapels and mausoleums, lookouts or belvideres, pavilions and kiosks, etc., with simpler or richer treatment, and being intended for most diverse purposes, they afford suitable subjects for the artistic creative power (Figs. 145 to 147). Here likewise belong those very spacious buildings, where the nucleus of the design forms a single room, divided if possible, or a hall, then shaped in accordance with Div. 5, Chap. 4 of this volume. The noblest monuments for the worship of the Deity, the cathedral and the church, are also included, as well as enclosed structures of all kinds.

111. Tower-like Structures.

The building is further changed, if the problem requires a division of space in height, thus forming a design in two or more stories. A necessity then appears for connecting the stories, and stairs serve this purpose, there being sometimes arranged on the exterior, but are usually in the interior of the building. In the last arrangement, a side room is usually added to the principal apartment for a stairway (Fig. 148). Yet the staircase is often built free within the room. This is in towers almost invariably the case; their purpose is less to provide several rooms above each other, than a room of unusual height, necessarily limited or enclosed. The isolated tower is to be first considered, and which as a belfry, watch-tower, fortress-tower and gate-tower (Fig. 149), a lookout, water-tower, bridge-tower, lighthouse, a clock and bell tower or a campanile, is capable of unusually varied treatment. It is indeed the crown of the building, the expression of an elevated room, treated in accordance with the special purpose to be served, and generally affording a suitable and effective motive.

Yet the tower is frequently not detached or isolated, but a very characteristic portion of the design of the building. For churches, city halls, etc., it has acquired by tradition a typical importance. It usually serves as a staircase tower to connect different stories. But such a prominent and monumental architectural mass shall never be so degraded in its

importance, that without any purpose, it is added as a mere accessory, and in paltry dimensions serves as the sport of an erring fancy. The preceding considers only the most important of the buildings of this class, but an impulse is given to deeper study of these very interesting and graceful creations of architecture.

1. Buildings of Compound Form.

112. Principal Points.

As in the case of simple forms of buildings, there again come under consideration two different things, which are of decisive importance in the general form of the structure and which can alone be considered here: the form of the plan and the shape of the roof.

From the latter results the upper termination and from the former in a manner, the lower ending. If both are combined and are united by the vertical outer walls with due attention to the changes in form upwards, we not only produce thereby the external form of the building, but also an expression of its interior, sufficient for our purposes. This suffices for the internal form so much the more, since each room appears for itself, and the room was described as the element of the building in the preceding chapter.

1. Form of Plan.

113. Arrangement of Rooms beside each other.

We will first take up number and sizes of the rooms. The question now arises, how and in what order are the rooms to be arranged, and it must first be decided, whether the building is to be in one or in several stories. With all rooms in one story, the horizontal extent of the building is naturally much greater, and even with limited dimensions, the ground form will quite differ from that arranged in several stories. The choice of either mode chiefly depends on number and purpose of rooms, and also on whether the uses of the building require all rooms to be of equal height or not. In the latter, arrangement of the staircases to connect different stories becomes very important; they do not exist in the first, or are of subordinate importance.

114. Rooms for Facilitating Access.

But in both cases, accessibility of all parts of the building is the first requirement in treatment of the plan, and this demands rooms for general use, which like stairways facilitate passage within the building. These are ante and connecting rooms, vestibules and entrance halls, halls and passages, courts, corridors, or galleries, stairways and lobbies, which for their importance are termed arteries of communication in the architectural organism. They are here only considered in regard to utility and

suitability, and both the beauty and design of the building depend on their arrangement, connection, and their distribution in the ground plan. They must be so designed that separate parts of the building and the rooms may be readily accessible, easily separable, and at the same time may be opened for free admission of light and air. This will be best attained by a clear general plan, with a spacious, but compact arrangement of these means of communication.

While in simple designs for houses a vestibule or passage suffices, in extensive and complex forms of buildings, these ante rooms frequently occupy considerable extent. Their plans must be briefly mentioned, since they form a leading motive in the treatment of complex forms of buildings. (Div. 5, Chap. 1).

When permitted by the site and the money at command, corridors are best arranged along an external wall, since communication is thereby favored and light and air are best admitted. Yet this is bad, when the corridor extends along a common division of fire wall, and the same occurs in case of a middle corridor. Both arrangements are objectionable in many buildings. When permissible, care must be taken in their lighting, partly by direct and partly by indirect light. Windows at ends serve for this purpose (Fig. 152), also light corridors as in Fig. 150, or projections of corridors and stairways at proper places are better, and also light courts, skylights and glazed doors as mentioned in Art. 104. Width of corridors varies with their purpose. It is least for servants' passages, and is fixed by the possibility of convenient passage and of placing at the end a narrow door with its finish. In extreme cases 2.95 to 3.28 ft. will suffice; if two persons are to pass each other, then 4.28 to 4.93 ft. will be necessary. But a long or side corridor in public buildings should have a width of at least 6.56, or better 8.20 to 9.84 ft. A central corridor for frequent use is to be made correspondingly wider.

Like all rooms for communication, the arrangement of corridors otherwise depends partly on the building site and surroundings, partly on the purpose of the building, and from their arrangement chiefly results its ground form. For in their combination these rooms form the skeleton of the building, around which are grouped in organic sequence member by member, and room by room. The ground form of the building will also be influenced by other circumstances of a partly practical and partly theoretical nature, by number and size of parts of the building, by possibility of good lighting and abundant ventilation, by regard to external appearance, to suitability, to tradition, etc. Many kinds of buildings, as churches, theatres, hospitals, prisons, etc., have acquired typical ground

forms under the influence of these different causes.

115. Depth of Parts of Building.

The depth of parts of the building determine its form. It was shown in Art. 98 that one must be guided by dimensions of the different rooms, especially in fixing their height and depth in accordance with construction of the ceiling and possibility of good lighting by daylight, etc. Proceeding from these considerations, we find the average depth of a part of the building, as in Figs. 151 to 153; and from dimensions previously given and with due reference to the thickness of the walls, these are made as follows:-

1. For a plan composed of a single row of rooms with or without a longitudinal corridor, about 23 to 39.5 ft.
2. For a plan composed of two rows of rooms with a common central corridor, about 39.5 to 59.2 ft.
3. For a plan consisting of three rows of rooms with two corridors, about 59.2 to 82 ft. or more.

116. Extent in Length and Height.

The depth of a part of the building is determined thus, and unless unusually large rooms are provided, it will be kept within these limits. After either three arrangements is chosen, assuming the ordinary rectangular form, the length of the building is easily found, after the ground area to be covered has been approximately determined as explained in the next Chapter. Its height is afterwards most simply computed from number and height of the different stories.

11u. Ground Form.

If the length obtained in this way differs little from depth of building, an approximately square or slightly rectangular form is given to it, and is usually one preferable (Fig. 154) It has been stated in Art. 94, that the former is more economical, because it requires least total length of enclosing walls, assuming these to be of uniform thickness. But the latter seldom occurs; it is for this reason otherwise in buildings divided by cross and middle walls, since the division walls of a square plan require greater length than for a rectangular one of equal area, though the converse is true of middle walls.

It is not possible without further discussion to state the preferable ratio of length to breadth of the rectangular form, this determination being based on the internal subdivision and must therefore be left to special cases. Yet in arranging in sequence a number of rooms of given areas in a selected form, it is advisable to give to it greater depth and thus a lesser extent of facade. Though greater total length of thin di-

vision walls is thereby required, yet less extent of thicker and more costly outer and middle walls that support the ceilings and roof is necessary. To reduce the total length of the latter to a minimum is certainly most rational, though attainable only within certain limits. To fix these limits is important on account of cost, both for simple and frequently repeated designs, where maximum economy is required, and for large and important structures, since with their extent economy in cost increases. The general arrangement of plan must be fixed before relative dimensions of the ground form of building may be so computed, that with unchanged area, the total volume of walls may be made as small as possible. Attempts have been made to do this. Fuhrmann investigated detached buildings of rectangular form and those composed of rectangles. Maurer made similar inquiries, and went further by finding the cost of constructing the walls, and also that of excavations, and of constructing ceilings and roofs. Schmitt, for special buildings (houses for railway guards) assumed fixed areas for the different rooms, and computed dimensions of length and depth to be assigned to each room.

With a large ground area to be covered, and after depth of building has been determined, an elongated rectangle results as its general form. As usual for long external walls, projections are preferably arranged at the angles or center, as in Fig. 155, in order to thereby obtain better proportions of the masses in the treatment of the facade. Care must be taken to make these projecting masses either decidedly wider or narrower than the recessed wall surfaces. Approximately equal subdivisions produces monotony, and too frequent projections and recessions of relatively small dimensions have a disquieting effect. These projections also serve to accent important portions of the building, and should in all cases correspond with divisions into rooms in the interior.

Yet for a very extended length, it often becomes impossible to take the simple rectangle as ground form of the building. It is permissible to add wings to the main building. Combinations of rectangles are to be preferred, which suit the site and fit the programme. According to circumstances, combinations in Figs. 156 to 160 are suitable therefor, are partly symmetrical, partly unsymmetrical in arrangement. These are all open forms, or permit free access of light and air on all sides. With these may be contrasted closed ground forms having one or more internal courts, as in Figs. 161 to 164. Variations in Figs. 162, exhibit specimens of partly circular, partly oblique form.

Ground forms of greater extent and of varied shape result, when from detached dependent buildings for a common purpose, a united group of struct-

ures is to be formed. Figs. 125, 126, are examples, where buildings really belonging together in plan are in part closely, and in part loosely connected. In many designs of similar character, combination is intentionally avoided. The decision of which ground form is preferable must be left to the different cases; also whether symmetrical or unsymmetrical grouping is to be preferred. Referring to Div. I, Art. 21, it may be briefly stated, that not only in buildings of monumental importance, but also in those built in solid blocks, a symmetrical design is usually more suitable, and for isolated structures on elevated sites among picturesque natural surroundings, a freely and boldly subdivided type of plan is best adapted. The ground form must always correspond to the purpose and be truthful, therefore be developed from interior outwards; it must not be fixed with sole reference to external appearance and be an artificial exterior, but must be suited to the mass of the building. Hence one must not build from exterior inwards, but from interior outward, to determine the form. This treatment of the interior and the division of the plan in detail will be taken up in the next chapter, referring to selected examples. Aside from these, we must then examine different modes of treating the plan, originated by requirements and views of the time, which appear in the surprising and artificial forms of castles and palaces in the barocco and Rococo periods.

2. Treatment of Roof.

118. Ceiling.

The form of roof and the form of ceiling influence arrangement of plan in some buildings, especially in structures containing large rooms, and which belong with the halls and assembly buildings described in last division; otherwise, the plan influences the roof in form and construction. In regard to forms of ceilings of entire buildings, it may suffice to remark that according to Art. 99 ceilings are generally arranged in accordance with the division of the building into stories, and variations from this rule only occur in cases of especial importance.

119. Forms of Roof.

Treatment of the roof as upper termination of the structure is capable of unusual variation and improvement. It contributes to the characteristic and effective exterior of the building, not less than combination of the different masses and subdivision of these masses horizontally and vertically. These motives have an essential influence on the form of the roof, which is determined by the following factors:-

1. By the horizontal section or ground form of the building, which results from combination of the different parts of the structure and fol-

1. cws changes in direction of external walls.

2. By the vertical elevation, which either terminates at a common height or at different heights, according to whether the different masses of the building have the same number of stories or not.

3. By the form of cross section of the roof.

4. By the possibility of proper removal of rain water.

The first three factors occur in such varied ways, that their combined effect produces numberless forms. The fourth is no less important and causes important difficulties in buildings with closed forms of plan having two or three rows of rooms (Art. 115), as well as for houses in blocks and those of irregular plan. It is sometimes necessary to arrange the interior portion of the building as a kind of platform of slight slope, rain water pipes being carried down within the building itself, an arrangement only to be employed in the most extreme cases and with the greatest precautions. It is not necessary to investigate how the removal of water is best attained; yet this is shown in part by the following illustrations.

Some combinations of roofs are partly produced by variation of ground form and partly by difference in height, the upper termination of the building being effected by the surfaces of the roofs, as represented in Figs. 167 to 173. These are based on the most useful combinations of different parts of the building as described in Art. 117. These examples suffice to show the influence of form of roof on main form of the building, and to illustrate their external appearance, together with the grouping of the masses of the building resulting from form of plan. The illustrations are here based on the usual forms of sections already employed for simple forms of roof. They principally differ in greater or lesser inclination of plane roof surfaces, instead of which curved surfaces are common. From combination of these simple forms result compound profiles as in Fig. 174.

120. Development of Roofs.

That forms of roof are very capable of bold and graceful treatment is shown by numerous classical creations of the mediaeval and Renaissance periods, especially by monuments in northern countries, since men were there led by climatic conditions to the most suitable design for these portions of the building, for which these periods well understood how to invent artistic forms suiting the locality is proved by well known historical examples.

The same conditions exist now as in earlier times. The form of roof must afford protection from rain and sunshine, and this requirement must be expressed by its treatment. Why should we be ashamed of this neces-

sary and rational protection and seek to conceal the covering of the buildings. The stupid imitation of foreign monuments, built under another sky and for different customs, led to this error. This must be the reason that men recently constructed flat roofs alone and neglected their development. For whatever is not readily visible receives no care. Roofs certainly afford motives for the uppermost adornment of the building, and masterpieces produced under conditions that still exist, may serve as models.

It is then clear each part of the building must have its roof, and every important room must be distinguished by a crowning portion of the roof, gable, etc. This occurred during periods of highly developed architecture, and it was reserved for periods of decadence to place halls and kitchens, large and small rooms, under one roof and to clothe them with a monotonous covering. This is called "monumental repose". Such views have fortunately dissappeared; men are convinced that by rational forms of buildings and by natural grouping of architectural masses better effect is produced than by vapid ornament or worn-out motives for architectural treatment. Employed in a massive way, this is but a means of obtaining suitable importance for the modest rural building, as well as for the prominent monumental structure. Men have sometimes gone too far, and a danger exists that the picturesque element may obtain the mastery.

Chapter. 4. Designing.

121. General.

The problem for the architect in the erection of a building has been brought within narrow limits, and we have more nearly attained the proposed end, the designing and representation of the structure. Moreover to reach this aim, besides the creative idea, neither system nor order must be lacking; an attempt will then be made to indicate the beginning points from which designing is to proceed, while some examples will be added as illustrations. Each problem must be considered as a whole, and in designing the plans, we must pass from general sketches to details.

This is not opposed to the given law, to build from the interior outward and not from the exterior inward. For this comprises exactly the difference between research and invention, between study and personal creation in architecture. To solve the requirements and arrangements of a building, and to deduce conclusions for the plan of the building, are the process of study and solution of a problem. To commence with designing of structure as a single coherent whole, to pay due regard to its chief points, then to consider requirements in detail, to arrange all in order and bring them into harmony, is the method of independent creation and

of artistic design in architecture. Thus to first hew the statue in the rough without regard to fashion of the clothing, to first fix the structural organism, to bring every member to its place, to concede prominence to the important, to retire the unimportant, to arrange and join everything in due sequence, and lastly, to give to work shape and form, is the problem for the first sketch.

122. Design.

The design intended for execution is not the work of a moment, or result of the first and best idea, appearing in a quickly made and talented sketch; only after hard labor and conquering the difficulties of the problem, does the idea attain perfect clearness. The first sketch is followed by a second and a third, the work becomes simplified, obstacles disappear, the essential becomes prominent and the unimportant recedes, and we suddenly see the path leading to our aim. Earlier sketches no longer satisfy us; a new and better image of the object is before us; we lay hand again to the work, which is tried and changed, this part being transferred from right to left, that from front to rear; every part now assumes its natural place, as if it could not be otherwise, and the problem is solved. To bring it to this point, no pains are spared to test it again and again until the building is developed in clear and simple form, for which both stern self-knowledge and untiring creativeness are necessary.

Yet the plan comes first and then personal criticism. Never permit paralyzing doubt to appear, that disintegrating criticism of the creative thought, before this is developed, for despondency is just as objectionable as overweening self-conceit. One does not first loose himself in details, which readily arrange themselves afterwards. With pencil in hand and fresh for the work, it is then tested, changed, and again tested, which is the way to attain the end. In accordance with the preceding, the design of preliminary ground plan is most important. If the building be built up in the mind, one may have a general image of the entire work; but he cannot proceed at the same time with everything necessary to its graphical representation. We must commence with primary drawings, with the ground plan, and not with the elevation of the building. Attention is given to the ground plan first, and in designing it, the factors of the problem before developed and which influence external and internal forms of the building will be considered in the proper place.

123. Plan of Site.

One should then commence with the location and aspect of the building, according to Art. 88, and these are shown on the plan of the site. This exhibits the form of the ground for the building and its surroundings.

On it is provisionally drawn the ground form of the structure, existing or contemplated streets and alleys, plans of gardens and out-buildings, enclosures and gateways are also shown, and heights and other conditions of the ground are noted and utilized in the best manner. The determination of the general plan is naturally first made; this requires further attention, should the design be materially changed during later studies. But in order to give merely approximate extent and ground form of the building on the location plan, an approximate calculation of area to be covered by the building is required. By the aid of the programme this is usually made as follows.

124. Area of Ground Covered.

After the number and sizes of the useful rooms have been fixed on the basis of space requirements of programme, and the total of superficial areas obtained therefrom, we add to this a certain per cent for thickness of the walls and for vestibules and rooms for passage, which varies for the chief kinds of buildings, and is to be so taken that sufficient margin remains for additions and reductions required in combining them together. From experience, this may be taken at 20 to 40 per cent for buildings of utility, for ordinary dwellings and private houses, and for buildings with very large rooms and proportionally few vestibules and corridors, etc., at 50 to 70 per cent for simple and compactly arranged public buildings with two rows of rooms and common central corridors, and at 80 to 100 per cent for rich and expensive designs of this kind with spacious entrance halls and stairways, corridors having rooms along one side only.

The numbers afford only a general and probable basis and are taken within wide limits. But by comparison of the structure to be designed with executed buildings of similar character, the total floor area of all the stories of the former may be easily computed within closer limits, and after the number of stories has been fixed, the ground area to be covered is found approximately. It is to be considered next whether isolated rooms are placed in a mezzanine story or in an attic extending over the uppermost story.

125. General Arrangement.

After proceeding in this manner, especially in the larger programmes, and after the approximate cost of building has been estimated according to Art. 90, it is then proper to decide on the general arrangement of the building with due regard to its site and surroundings, and it should then be made clear according to Art. 117, whether it is to form merely a single enclosed mass, which must be solid or opened by one or more courts,

or whether separate wings of the building are to be arranged, and these are to be connected or detached, or finally, whether the whole may have an equal height, or whether some parts of the building are to be lower and others are to be made higher.

126. Ground Plan.

Passing from general to details, from great to small, we then have to determine the principal rooms and the rooms subordinate to them, what rooms belong together, and which are to be separated, or briefly, how and where everything is to be most suitably placed on the plan. Requirements in detail and advantages and disadvantages of the intended arrangement are to be considered together, and since it is never possible to have everything in equal perfection, the important must take precedence of the unimportant; accordingly even in the sketch ground plan, chief rooms are to be distinguished from others, that they may be recognized at the first glance.

The problem will be the more simple, the smaller the number of rooms to be combined in one story, and the more freely one can arrange them. Even combining together similar rooms in several stories presents no difficulties, compared with those of rooms varying greatly in size and purpose, to be arranged beside and above each other. Not only depth, but also height of the rooms will then sometimes be dissimilar, and interruptions of the stories become necessary; form and construction of the structure and its lighting will be more difficult, especially in rooms beneath large halls and at intersection of the wings of the building. Upon the skillful utilization of these intersections and of other unfavorably located portions of the plan, the connecting of vestibules, stairways, rooms with skylights, light courts, etc., with adjacent subordinate rooms, which are often added at such places on the plan, depends chiefly the successful solution of the problem.

In designing the plan, the lighting of all parts of the building determines the ground form and internal subdivision, and affects its general arrangement. We commence with the arrangement of rooms and parts of the building, fixing depths of the rooms and heights of stories in accordance with previous statements, then proceeding with arrangement of vestibules and of rooms for communication. This is to be decided next after location of the principal rooms and of entrances to buildings; these being the purpose of the former. Separate entrances for persons and for carriages are frequently required, whose proper connection with corridors, stairways, etc., forms an essential part of the problem. Center lines of halls and of entrances usually indicate axes of direction of the build-

ing. Their coincidence is indispensable in monumental buildings, but is to be preferred in less pretentious structures. The principal axis of the building is perpendicular to its principal facade, the transverse axis extending parallel to it through the middle of the building. Parallel to these two directions side axes often extend through the centers of adjoining or receding buildings on each side.

127. Subdivision by Axes.

Subdivision by axes generally extends to the exterior, as well as the interior of the building, even if in freely combined and irregular ground forms, offsets or breaks in the middle lines occur, caused by the arrangement of the plan. If this be fixed in its chief points, windows and doors, colonnades and piers, are arranged accordingly; and consistently with requirements of order and good construction, the axes of these structural parts are equidistant in the respective parts of the building, unless a definite reason exists for varying from this. Adherence to regular axial subdivision facilitates designing, and is a requirement of architectural composition, when suitability and truth are not violated thereby. This results from ground principles developed in Div. I, and is proved by masterpieces of architecture of all times and countries. Yet the system of axes may not be taken at pleasure. The unit must result from the subdivision of space in the building (Art. 97), and for structural reasons it must harmonize with subdivision by cross walls, lines of piers, compartments of vaults, etc., and not be based upon a mere fancy.

That one may go too far is shown by the designs, which at the beginning of this century were made on the squared system on the theories of Durand and Weinbrenner, which exhibit advantages and disadvantages of their method. Reference is made to works by these authors, and their predecessors, to designs and writings of Palladio and of older masters, which show a rigidly symmetrical subdivision by axes. The arrangement of the principal points of support determines the system of axes. This is evident in larger plans, but also appears in smaller and in freely grouped structures, at least in their chief masses. Such data in reference to absolute unit of measure used as a basis for the system is given in the Table (Art. 100). A comparison of buildings shows that with both very small and very large axial distances it is possible to make the scale of the building clear by suitable grouping and subdivision.

128. The Elevations and Sections.

After the axial subdivision the treatment of external facades and of internal sections is to be arranged, and when the ground plan is substantially designed, sketches are made comprising main lines of facades and

of sections. When the design has progressed so far, a perspective view should be made for a detached building before it is worked out further; valuable indications are thus obtained for proportions and treatment of the architecture, which cannot be properly presented by the elevations alone. For its importance, this will be discussed in the next Division. To illustrate and develop the ground principle of the designing, plans of some executed buildings will here be given, to indicate the method to be followed in certain cases.

a. Building detached on all Sides.

1. Freely Grouped.

129. Castle Stordalen in Sweden.

However unrestricted may be the plan of a building, the design generally shows an endeavor to arrange the principal parts of the structure symmetrically, to extend the main axis of the building, and to place its different masses according to axial subdivision. This appears in Castle Stordalen in Sweden (Figs. 175 to 177). The illustrations give no information in regard to the surroundings and orientation of the building. Yet the best facade is evidently the principal front, symmetrically arranged about a chief axis A B extending through the entire building. The principal apartments are evidently placed there, and are arranged on a transverse axis perpendicular to A B. In addition to the basement story, the space requirements of the problem are satisfied by a ground story, and a story in the Mansard roof. Other conditions of the programme permit an arrangement of the plan by grouping social rooms and family rooms on the ground and first floors around a common hall from which they are directly accessible and form a complete whole, but so connected that the principal apartments could be used without being disturbed by the house-keeping or by passage of servants.

With the location of the chief rooms on front, the main entrance and carriage porch are connected with the corridor and vestibule, the three latter being placed on the main axis, with the first on a transverse axis C D at the angle of the side and rear facades, all being connected by the principal staircase. The halls are lighted by ceiling lights in both stories. But a servant's staircase with a separate external entrance is required, and is most conveniently placed in the side wing to effectually isolate kitchen and servant's rooms in the basement, which are also directly accessible externally from an area. This produced the plan in Fig. 175. Around the vestibule and corridors are grouped the social, living, and sleeping rooms, of very imposing dimensions, and to which on extraordinary occasions could be added the best rooms of the Mansard story.

It is unnecessary to go further with the subdivision in detail; reference to the illustrations is sufficient, which exhibit an effective elevation of the side facade and the ground plan.

The total utilized area of ground and first stories is 11296 sq. ft., an average of 5648 sq. ft. per story; ground area covered is 7335 sq. ft., hence 30 per cent additional is required for walls and rooms for passage; vestibules are not included in the latter but put with useful rooms; and terraces, hall over the light court, etc., are omitted.

2. Symmetrical Arrangement.

130. Gewandhaus at Leipzig.

The new Gewandhaus at Leipzig is a very instructive example of a symmetrically arranged building free on all sides (Figs. 178 to 181). As for requirements of the programme, on a site bounded by four streets the building stands free on all sides, but free development of ground plan was impossible, since its breadth was limited to 131.2 ft. The great concert hall is the starting point, and fulfilment of space, acoustic, and esthetic requirements is the aim of the artistic design. Everything else is only a means for the end but is scarcely less important practically. All influential factors led to the arrangement of two continuous stories, placing the great concert hall in the upper one, together with the adjoining smaller hall and the foyer. For its importance, the great hall is placed on two chief axes *A B* and *C D* and forms the nucleus of the building. The location of the small hall and of the foyer naturally occurred at front and rear ends on two subordinate axes parallel to *C D* symmetrically grouped in *I* form. Then from the prescribed total width of 131.2 ft., later increased to about 137.7 ft., as much space as possible was assigned to the width of the great concert hall, bringing these halls into convenient connection with each other and with the ground story.

It was most suitable for the given arrangement to place public stairways at both long sides and leading to different parts of the building. Two other stairways beneath the stage are placed on each side of the organ niche, and permit unobstructed access to the orchestra room and the soloists room, and longitudinal corridors lead to those for the public between the stairways, great hall, and foyer. The smaller hall is placed symmetrical with the foyer and furnished with two additional stairways and a small vestibule, and is located within the area of the old building, to be chiefly used for chamber concerts. But since evening entertainments are generally held therein, it is arranged that the stage and seats can easily be removed. In case of very great festivities, it and the foyer can be opened for general admission of the spectators.

This simple and clear arrangement of plan of principal story produced one equally satisfactory for the lower story. The latter was required to contain certain rooms in proper sequence, suitable to both admit and afford egress to audience and performers. A vestibule with three doors for persons on foot combined with two side vestibules for carriages to form the entrance hall. Next this on the main axis A B is the large hall with clothes room for gentlemen and ladies, then the vestibule to the smaller hall, and on the transverse axis are entrances to main stairways and to the boxes. The external and internal architecture (Figs. 179 and 180) produce a truthful and noble effect.

Without exhaustive detail, the great concert hall, measured between points of support of the ceiling, has approximately these proportions of length: Breadth : height :: 4 : 2 : 1.5 (124.5 : 62.3 : 47.9 ft), and including all boxes provides 1588 comfortable seats with space on the removable stage for 104 members of orchestra and 300 singers. The smaller concert hall has nearly the same proportions as the larger, or its length : breadth : height :: 4 : 2 : 1.4 (75.5 : 37.6 : 26.3 ft.), and contains 843 comfortable seats. For each seat in both halls (1588 + 843 = 2231) there are allowed an average of 13.15 to 13.45 sq. ft. of gross ground area covered by the building. If we compare the net useful area of the principal story (the lower story cannot be considered) with the ground area covered, an addition of over 75 per cent to the net useful area is required.

b. Building not detached on one or more Sides.

1. Rectangular Ground Plan.

131. Girl's School in Hamburg.

The Girl's School of St. John's Convent in Hamburg is represented in Figs. 183 and 184 and was built adjoining neighboring houses on a site with frontage of 141 ft. and average depth of 180.5 ft. The rooms required were class rooms for about 800 girls, singing and drawing rooms, gymnasium, large audience hall, residence of the director, and rooms for several female teachers, which required a building of three stories. From the restricted site of the building, it is obvious that a front wing with two rows of apartments and central corridor would not adequate, (Arts. 124, 116) making it necessary to add a wing extending the entire depth of the land, and consisting of a single row of rooms with side corridor. Local conditions (orientation and good lighting) made the location of this wing on the main axis A B of the building most suitable, thus producing a ground plan of T-form, placing most class rooms on the open and quiet garden front, with the great hall, the residence, and some elementary and seminary classes on the principal front.

With three rows of double desks and comfortable aisles, depth of the class rooms was made 21.7 ft.; those of gymnasium, drawing room, and of class rooms above these and in rear of the main building were 23.0 ft.; that of front elementary class rooms was 20.4. The central corridor between them for direct communication was rather narrow at 12.2 ft., the total depth of front building being fixed at 32.4 ft. Distance from street line being settled by the house adjoining on the right, the great hall was first placed at right angles to chief axis A B. It could then be set back to line of house adjacent on the left, and the entire depth to rear wall of the corridor assumed and a central scheme adopted, for which 131.2 ft. remained after cutting off two class rooms each on at right and left. Since the hall extended through two upper stories, its height was satisfactory.

It was evident that the entrance and main stairway should also be arranged on axis A B, the latter being at intersection (Art. 126) of front building and rear wing. The outlines of the wing were then laid out after width of corridor was fixed at 9.2 ft. and total width at 36.7 ft. To this corridor was added at the rear^a stairway and a toilet room for each story, with covered portico before class rooms for use during bad weather. For central corridor of front building, stairways were likewise indispensable, especially in the upper stories. They were placed at each end with light courts and were further lighted by skylights. This was the general arrangement of the building, sufficiently illustrated by plan of passages (Fig. 182) and by plans in Figs. 183 and 184. Arrangement of ground story and subdivision of the class rooms, living rooms, etc., do not require further notice.

For each seat there is allowed about 13.2 sq.ft. ground area covered by the building, including rooms for common use and the residences. If the three stories are taken and the average utilized area be compared with total ground area covered (the hall being counted as a single story), the latter exceeds the former by about 90 per cent.

2. Partially Oblique Ground Form.

132. Palace of Archduke Louis Victor in Vienna.

This usually results from the form of the site, especially when buildings are erected in blocks. This is the case in Palace in Vienna (Figs. 185 to 188). This site was very restricted in both location and area (15600 sq. ft.) and a further requirement was made that the palace should have external similarity and height with the residence of Von Wettheim, then being constructed on the opposite corner.

To explain the general plan, it is only necessary to mention the require-

ments of the programme.

Above the cellar story with its kitchen and store rooms, laundry and bath rooms, a ground story for stables, coach house and servants' rooms was required, then a mezzanine story intended as a part of the living rooms of the Archduke and his household. The first principal story was taken for the social apartments, the salon of the Archduke and the living apartments of the Archduchess, the second principal story containing other living apartments for the household and the servants. The entrance hall, the principal stairway, and the festal salon in the first principal story were designated as the chief objects for dignified architectural treatment. The salon became the starting point. Its location directly on Schwartzenburg Palace, the entrance hall beneath A, the direction of main axis A B, all are naturally indicated. At the right of the festal salon could be placed the dining hall, detached from the living apartments. The moderate depth of the latter required the same depth of the salon on account of the limited space, but the salon obtained width required for external appearance of the building by the flanking angle bays on the principal facade. The projection of this part of the building was fixed by the internal arrangement and by the different depths of the two halls from the continuous middle wall.

After these principal apartments had been previously fixed, there remained the salon suite of the Archduke and the apartments of the Archduchess on the fronts on Ring St. and on Pestalozzi St. A wing could then be carried along Ring St. facade with a depth of 29.5 ft. and one along Pestalozzi St. 24.6 ft. deep, the obtuse angle being properly adjusted by the circular bay. The plan was thus externally completed. To plan a spacious and beautiful court and a grand and dignified stairway in the remaining internal space was no slight problem. Without injury to general effect, this was solved by placing the staircase at right angles in the corner of the palace, starting on transverse axis of entrance hall, leading through mezzanine story and ending there. According to the limits on the place, a wing 28.3 ft. wide was cut off, and the conservatory was made 21.4 ft. wide on the Ring St. front, with a vestibule 14.1 ft. wide behind the festal salon. A narrower corridor opposite forms the fourth side of the court which is 48.0 ft. long and 38.0 ft. wide, its walls composed of arcades with three and four openings each, and windows for lighting the apartments. That corridor leads to a side staircase placed behind tween sides of the angle and at apex of the internal triangle produced by irregularity of the site. The remaining space is employed for adding subordinate rooms and a light court at the rear of the adjacent

structure.

This is the general arrangement of the principal story, illustrated by the plan of the passages, Fig. 188. Subdivision in detail proceeds without further difficulty, like the lower story. Of especial interest is the ground story with noble entrance hall, the commencement of the staircase, and the carriage passage from Schwartzenburg Place to Pestalozzi St. The principal facade is shown in Fig. 187 and corresponds to the requirements of the problem. A comparison of the ground area covered with the utilized area is limited to the principal story and an addition of 80 per cent to the latter is required. The limits for these explanations would be exceeded, if the method for designing were discussed further. The way is opened to be pursued in the next Division.

DIVISION IV.

TREATMENT OF EXTERNAL AND INTERNAL ARCHITECTURE.

By Professor Joseph Buhlmann.

Chapter 1. Forms of Facades.

123. General.

The appearance of a building depends on two factors. The first is the form of its entire mass, which primarily impresses itself upon an observer, and at a distance this is alone perceptible. Secondly come the vertical surfaces of these masses, usually only visible near at hand, ^{but} which by their subdivision and ornamentation produce the particular impression or individual artistic effect. It will be best to briefly summarize that said in the preceding Division on the first point.

The mass of a building may be united or closed, may be divided in detached masses or be grouped. A closed form produces a simple prismoidal, cylindrical, or pyramidal mass, if the programme proposes a very simple purpose, fulfilled by a single room, or if similarity of required rooms permits them to be combined in a single united form, indicated by reasons of construction and suitability. A grouping of the entire building occurs if the building programme requires a number of rooms, serving for unlike purposes, and which can properly be arranged only in separate buildings. The organic connection of the different rooms requires a combination of the masses into a single architectural whole. By prominence of the chief portion and subordinate annexing of less important rooms in a symmetrical position along a main axis, diversity of such an architectural group produces a united and organic appearance. Since the arrangement of rooms

affects the external form of the entire building, it is clear that in designing the ground plan, the external appearance must be considered, so that plan and elevation can in their essential forms only be designed together.

If in Chapter 1 of this Division forms of facades be treated without examination of the different purposes of the building, only in regard to external form, this can only occur for single and detached forms of buildings, or for separate architectural masses forming portions of grouped structures. The grouping may here be considered only from ordinary points of view, and must in the expression of the different structural forms be treated in accordance with the diverse purposes.

134. Construction of External Walls.

External surfaces or facades of every structure are first dependent upon the construction of the external walls. This requires a vertical position of the walls, their diminished thickness upwards with resulting batter or offsets; it further requires placing the openings above each other and a firm and pier-like treatment of structural masses between them. Even protection of the external surfaces by a projecting roof or cornice may under some circumstances be considered as a structural requirement. That the external walls of a structure may produce a durable and monumental impression, they must have a combination assuring the greatest possible strength, and materials must be employed possessing great resistance to all external influences.

As the simplest construction a superposition in courses or a stratification of the material, and natural or artificial stone has proved to be the most suitable and durable material. All walls constructed of a framework of wooden posts and beams produce no monumental impression, on account of the slight durability of the materials, and by the relatively small strength of the construction itself. Yet upper terminations of facades may have a projecting framed construction in simple corbelled form, and this may be so treated as to harmonize with the stone wall in regard to durability.

135. Vertical subdivision of Building.

The artistic treatment of facades naturally follows the construction; it first strives to produce an effect of stable resistance, which essentially determines the monumental appearance of the architecture, and then subdivides the vertical elevation in a manner appropriate to firm construction. According to this view of the treatment of the facade, there result as essential parts of every facade:-

1. A firm foundation or a thickening of the wall interposed between

it and the ground. This footing becomes externally a platform or a base course, on which the building appears to be built. It may consist of a strongly projecting base or of a high and slightly projecting offset. It always demands simple form without ornament and the expression of great resistance, best produced by using conspicuous and massive cut ashlar with wide beds.

2. The actual enclosure of space by vertically aspiring walls, whose structure is externally shown by the horizontal courses. In ashlar masonry, a reduction of height of the rate courses upwards corresponds to diminished thickness of the wall, and more readily permits this to appear with the increased height.

3. The projecting edge of the roof above the wall is supported by the uppermost and projecting courses of the wall, these together composing the crowning entablature. In most monumental forms, the edge of the roof is exclusively supported by stone courses, which are of different forms but compose a homogeneous stone entablature. In contrast with the development of the base or footing, these upper and prominent courses should have a character of the greatest lightness; they should represent the free ending, the uppermost termination. These peculiarities belong in a high degree to entablatures of wood, and it is therefore natural that forms originally worked out in wood should have become, and continued to be typical for stone entablatures also.

136. Horizontal Subdivision of Building.

While the construction of the building necessitates subdivision in a vertical direction, the purpose of the structure causes a division horizontally. This horizontal division usually extends from the center as an axis of similar masses or of symmetry, arranging the masses on both sides of this similarly, and placing terminations at each end. As for special treatment of the centre in accordance with purpose of the building, this may be developed from a simple portal to a richly treated central architectural mass. The side terminations first appear in using at the angles a stronger material, larger ashlar, or projecting pilasters or piers for strengthening the wall. In extended designs of facades, these endings consist of special architectural masses, to which is assigned an importance subordinate to that of the central mass. The vertical and horizontal subdivisions must permit the facade to appear as a unity, to which nothing can be added or removed without thereby injuring its perfection.

Every building must stand in contrast to its surroundings as an organic whole, only appearing to be connected to the ground by the universal law of gravity. Around the chief apartment for material or ideal uses,

through which passes the principal vertical axis of the central portion of the elevation, subordinate rooms are grouped along horizontal axes extending from the center. The enclosed space rises from a firm base and extends upward in accordance with the laws of growth and in opposition to the force of gravity. The external surface or facade of the building causes these internal factors of the whole to appear externally; it expresses both structural requirements and the intellectual importance of the building.

a. Vertical Subdivision of Facade.

137. Expression of Construction.

If in the design of the facade structural elements alone appear, a simpler and severer character will thereby be produced. The particular expression is that of the mode of construction, which is dependent on building material and kind of masonry. By a construction severely executed in even the external appearance, only a very moderate variety of form can be produced, and such a treatment of the facade cannot rise above the rude character of mere utility. Yet structural forms may assume decorative shapes and may be combined with forms not structurally necessary, but which only serve for expressing a function, without dropping the rude character corresponding to the construction. Decorative accessories, used independently of the structural combinations, may lend grace and elegance to a building otherwise cold and severe.

138. Rusticated Facades.

Rusticated facades are the simplest and the most monumental form of structural facades, and are produced when in ashlar masonry the separate blocks are decorated by drafted margins and raised bosses (Fig. 189). A wall composed of dressed ashlar possesses equally in all parts great stability; to especially emphasize angles of projections or courses at the levels of the ceilings does not appear to be required. As for heavy masonry, the base of this form of facade must be massive and strongly projecting. A projecting course of large ashlar may be covered by a slab above a step, thus being transformed to a seat. The bosses of the vertical wall may rest directly on this bench; yet the architecture of the Early Renaissance frequently placed there an intermediate cyma of form suitable for a base, and employed these together to compose a bordering band with a strong effect of shadow. In accordance with the structural character of the architecture, door and window openings were spanned by arches with bosses, or by lintels, if moderate in width.

Within the larger window openings is a recessed wall with graceful treatment in contrast to the stiff ashlar masonry and having an excellent effect (Fig. 190). Like a continuous band or belt with slight projection

and a gently curved cyma and dentil band, the window sill is effectively contrasted with courses of bosses and forms an easy division of the surfaces, without actually interrupting their vertical tendency. The window sill as a belt-course is nothing more than a slightly projecting and ornamented course of stone, and its height should therefore coincide with that of the other ashlar courses. The entrance door or gateway likewise requires jambs inside the bosses, and these may be developed from a plain reveal to a strongly profiled architrave (Fig. 191). A considerable depth of jamb is always required to produce the necessary appearance of stability. No rectangular window in the ground story or in any mezzanine story may dispense with an architrave next the bosses. It appears unsuitable to place large rectangular doors or windows in a rusticated wall and give them architraves, whose forms were derived from wooden construction, requiring straight lintels to support the masonry above them. The stability of the wall then appears to the eye as if injured by an insufficiently strong covering of the openings.

The entablature may always borrow its forms from entablatures of antique columnar orders, which chiefly originated in wooden construction; the Corinthian type with its rich subdivisions especially forms an effective contrast to the simple rusticated wall. Yet entablatures which appeared later in stone construction deserve full consideration in spite of their massiveness. The mediaeval cornice of Italian palace-castles composed of tall inclined corbels supporting stone slabs was the motive for a corresponding form of Renaissance entablature. A stone course decorated by a cyma moulding forms the base for corbels or consoles. These are inclined supports beneath the cornice that receive an ornamental form, which expresses their purposes. Above the slab and connected with it by its cyma moulding, the cornice rises as a free ending. Square spaces between consoles are suitable localities for rich decorative ornament in strong relief. (Fig. 192). If antique entablatures, those most suitable having forms much subdivided and rectangular or ogee consoles, be employed to crown ashlar walls, they must be treated with imposing height and severity to harmonize with the character of the lower architecture. By architects in the Florentine Renaissance the principle appears to have been established, that the entablature above a palace must be made large enough to be suitable for a colonnade of equal height. For the Corinthian type of entablature, this is from one twelfth to one-fourteenth the entire height. A plain frieze is divided from the wall surface by a boldly profiled course which preferably separated the refined forms of the cornice from the rusticated work.

The rusticated wall may in its height be changed from heavy to light effect by reducing height of ashlar and projections of bosses in the different stories. (Fig. 193) External surfaces of stones may vary from a boss of semicircular section to a flat boss with rounded edges. In old facades of this kind, the ground story is usually enclosed and has small windows. Yet there remain from the Renaissance period fine examples of such facades with great lower arched openings, likewise suitable for modern purposes. The completely rusticated facade emphasizes unity of vertical enclosure of space and combines different stories into a single form. The diverse character of the different stories may then be expressed only by dimensions and shape of window openings, while the proper subdivisions and especially the frame-work of the floor, do not appear externally. By their grand and simple form and their monumental stability, such facades make an imposing impression; yet they likewise possess a monotonous and gloomy character.

139. Richer Facades.

A facade of richer form is produced, if the elements of the vertical structure are apparent externally according to their importance. This may be done by making prominent the separate stories by limiting belt courses and by ornamental enclosures of their window openings. For this purpose forms are usually employed that did not originate in stone, but by their use in structures first built in wood and later in stone, they have acquired an expression suited to the latter material. To the esthetic character of these forms, retained even in the translation into stone, structural jointing of the wall must not be too strongly opposed or be out slightly contrasted, otherwise insoluble contradictions will arise. But in portions of the facade requiring special stability, an external prominence of structural forms is indicated. The ground story and the angles of projections may be treated as rusticated work, thereby forming an effective contrast with the smooth wall surfaces of the upper portion, which merely appears as a background for ornamental architraves of windows. (Fig. 194). In such forms of facades, with simple general form having clear subdivision, a great wealth of details and ornamental accessories may be developed. Yet the general character of the facade retains a certain strength and severity, while the general mass of the building appears as a quiet wall surface, where aspiration and opposition to force of gravity are not yet expressed by special forms. Special treatment of such facades will be in accordance with the number of stories, and it is then necessary to consider them in this respect.

140. Buildings of Two Stories.

In a building of two stories, the principal story may either be placed above a high ground story (Fig. 195), or may be placed directly above a low structure, then supporting an upper story. In both cases, a belt course is arranged externally at the level of the floor of the principal story, appearing as a high and slightly projecting course or band. The pedestal band required between this belt and the window openings has its own base and cap. The former is of simple and slightly projecting form, being scarcely visible above the belt from beneath, but the latter is formed with plinth and cyma mouldings. To make it prominent, the principal story demands an especially characteristic enclosure of the windows. Therefore that rich form may be employed, which is composed of a small shrine (Aedicula), having columns or pilasters and an architrave inside them. Pedestals for columns or pilasters will project from the pedestal band; between these and before the windows may be placed slightly projecting balconies with balusters. The strength of the belt course permits the projection of a balcony to its outer edge. The entablature of the pediment cap appears firmly joined to the wall, if the architrave and cornice extend along the wall as flat bands representing special courses of stone. The spaces enclosed between the enclosures of the windows and these bands are suitable for painted or sgraffito ornamentation, or for niches and figures.

As a massive band, the belt course is not broken around the angles; but the pedestal band must form a pedestal beneath the angle quoins and it then projects from the pedestal as much as the bosses (Fig. 196). If the principal story is placed above a ground story, the latter has a massive character by ashlar masonry, or at least by simple and plain forms of windows. Arched windows may be conveniently employed in the ground story, but those with straight lintels are to be used in the upper story. Between the windows of the principal story and the main entablature should be a wall space at least equal to the clear height of the window; but subordinate windows of mezzanine stories may be placed directly beneath the entablature and be connected with a broad frieze decoration. Only bosses of angle quoins project beyond the wall surfaces, the drafted margins being flush. Belt courses and frieze bands are then extended through these bosses straight to the angle without breaks. The Corinthian form of entablature is in height arc-fifteenth to arc-eighteenth part of the height of the facade. Its frieze beneath it has a good effect as a termination of the wall and transition to the cornice, while it forms together with the cornice a rich crown to the building.

141. Buildings of Several Stories.

In designs containing several stories, the principal story is usually placed over the ground story; the latter being treated as the substructure for the facade (Fig. 197). A subordinate mezzanine story may be interposed between these two stories and combined with the ground story on the exterior. If only a single story be placed above the principal story, then to obtain free wall space above the windows of the former, a belt course is only placed below the windows of the upper story. In contrast to the lower belt course indicating the floor, this is composed of a thin slab and cyma mouldings; a narrow frieze band beneath them gives it the height required for effective division of the surface.

If more than two upper stories are arranged above the ground story, it is then best to divide the facade into three principal surfaces, the lower one being characterized as the base, the middle one or highest one being the superstructure, and the uppermost one of less height being the crowning and dominant portion. The substructure may comprise both ground and mezzanine stories. Above the principal story, characterized by its external forms, the windows of the next story are placed directly above the entablature of the lower ones. Yet the lower windows must then have a strong projection and the upper ones have flat architraves; if treated too nearly alike, these easily receive a stilted appearance. The highest story will be joined with the main entablature like a deep frieze. Its window caps (if used) are connected by a band like an architrave, and must be separated from the main entablature by a frieze band. Surfaces between windows have light ornamental decoration by painting or sgraffito-work.

The portal usually indicates the axis of symmetry in the centre of the facade, and it may receive a rusticated arch or be enclosed by forms of the columnar orders. Its cornice should then be at the same height as the belt course, when the forms of the cornice and belt may differ in accordance with their varying importance. If a mezzanine story be connected with the ground story, the portal architecture may extend through the entire height of the substructure.

142. Facades in Ordinary Brick Masonry.

Facades in brick masonry with moulded bricks for belts, cornices, and architraves, may be treated with reference to peculiarities of the material in a pleasing and monumental way. Openings are to be arched, but there may be set within them a rectangular architrave of stone, with filling between arch and architrave. The material requires slight projections of belts and decorations so that the numerous cutting joints may not become appar-

ent, and beaded astragals, dentils, grooves on bands, etc. Continuous friezes and panels of pilasters must be so arranged on the drawings, that with repeats of the same forms they may appear connected and flowing. Architraves of doors and windows may be composed of decorated cyma mouldings and frieze-like bands, producing their effect less by bold relief than by rich ornament and clean profiles. The entablature is composed of several courses with projecting consoles, and in brick alone may produce an effective crown to the facade, but this should be combined with a wooden cornice attached to the rafters and projecting above it. If large openings or porticoes are in the ground story, piers or columns must necessarily be of cut stone. Excellent models are supplied by brick facades of Renaissance period in Bologna.

Certain portions of brick facades may be decorated by relief ornaments in terra cotta, especially the frieze above ground story or beneath the main cornice, and panels between the windows. A rich frieze is particularly suitable above an open portico in the ground story. This should be bordered above by a delicately profiled belt course, and beneath by a band like an architrave. The spandrels of arches are decorated by round disks or medallions. Magnificent ornaments of this kind in the Early Renaissance were composed of sculptured terra cotta reliefs enamelled in colors (Luca della Robbia). The simple and conventional coloring required by technical processes and the fresh and permanent lustre of the colors in contrast with the dead tones of the bricks lend a peculiar charm to this mode of decoration, so that for this purpose it is to be preferred to any other mode of ornamentation. An excellent effect is likewise produced by these glazed terra cottas on white stuccoed wall surfaces, when inclosed between sand stone belts.

143. Sgraffito Facades.

For decoration of surfaces of facades coated with stucco, sgraffito is especially suited by its similarity and durability (Fig. 198). This decoration may appear as a surface pattern either dark on light, light on dark, or as a hatched drawing. It harmonizes best with architectural forms when very little effect in relief is attempted, this being always slight in the process of sgraffito. Motives for these decorations are antique Grecian vase paintings, where within the outlines of figures only simple lines are used to separate different parts, the entire figures being then made prominent in light on dark or conversely.

Decoration of an entire facade by tapestry-like patterns is justifiable only in special cases. When two lower stories are composed of light arcades, like the Doge's palace in Venice, a high enclosed upper story above them can only be made endurable by giving the enclosing walls the greatest

apparent lightness, these being externally treated as tapestry patterns stretched between vertical posts at the angles. It is evident that no entablature of any kind can crown such a wall, only a light ornamental head-band. Architraves of the windows may likewise merely consist of delicate and band-like borders without relief. It does not seem proper to decorate wall surfaces of a facade by tapestry patterns, when it has massive belts, cornices, and window architraves. Cornices and enclosing mouldings always require a background corresponding to their own character, and when of massive forms, the solidity of the wall must be visibly expressed.

144. Employment of Colonnades.

In forms of facades so far considered, the enclosing wall appears as a neutral surface, serving as a back ground for architraves and merely subdivided by belts and cornices. The base connects the wall with the ground; the entablature terminates it at top; but both forms are merely borders above and below the mass, which is itself inanimate. As the last step in treatment of facades are those, where the mass and weight of the wall masses appear overpowered by forms, which represent vertical aspiration and growth and compose an organically animated structure. Mediæval architecture emphasizes only vertical aspiration and allows this to repeat itself upwards in forms, ever becoming more delicate. But Antique Architecture and the Renaissance create an ideal facade with a harmonious alteration of loads and of supports, of aspiring and of crowning dominant forms. The facade borrows the forms of temple architecture, where the colonnade exhibits this idea in the purest and most ideal form. (Fig. 199). The columnar construction is transferred to the wall surface in relief and is combined with other esthetic forms, which embody similar ideas. The representation of the structurally jointed and horizontally coursed mass of the wall disappears; we see a facade in esthetic forms, which originated in another material, have been conventionalized to suit stone, but represent a lighter construction treated on ideal architectural principles. A wealth of forms may be developed on the elevation in an organic way, which far excels that of earlier forms of facades. Since the entire structure possesses an ornamental character, other decorative accessories may easily be combined with it, even if they no longer belong to the organism of the facade. Such types of facades easily keep within limits of great simplicity, and thus preserve severity and earnestness of actual structural forms. Yet it is natural for decorative columnar and pilaster architecture to assume a light and graceful character, then producing significant effect by its wealth of forms.

In the composition of the facade, the decorative architecture is usually placed above a high substructure with bold jointing. Yet this may consist

of a stepped base directly supporting a series of pilasters or columns. In applying columnar orders to ornamental architecture of facades, two principal types are distinguished. Several orders are placed above each other and correspond to stories (Fig. 200), or a single colossal order is employed with the division into stories treated in a subordinate manner.

Facades of the first kind occur with even four orders above each other; but as in the following examples, a facade is properly and organically treated with two orders only. Pilasters are preferable to engaged columns, since they unite better with the wall surfaces and require a less projection of the entablature above them. The greatest difficulty is to produce a united treatment of the facade, so as to not produce an impression of two structures placed on each other, but to appear as a single structure, commencing with the substructure and terminating with the crowning entablature. The entablature of the lower order is considered and treated as a belt course, that of the upper order being the crowning entablature of the facade. The former has a simple form and slight projection; for the latter it is necessary to develop the frieze with high consoles, which permits strong projection of the upper portion without making it oppressively heavy (Fig. 201). The consoles in the frieze support a strong slab on which rest modillions that support the cornice. To give the upper order a lighter appearance, it is made one-fifth to one-fourth less in height than the lower one.

Pilasters or engaged columns are generally placed on pedestals; the lower order stands on a massive projecting substructure, and its pedestals have the usual subdivision and projection. But the bases and pedestals of the upper order may not project far, since the unity of the facade would then be broken by the width of these forms. Therefore these parts should have profiles of slight projection, being seen from beneath. A combination of plinth, scotia, and torus is suitable for bases of pilasters. The width of die of pedestal, and that of base of pilaster, should not exceed that of lower pilaster. Thus in spite of the slight projection of its base and its diminished height, the upper pilaster appears slender in comparison with the lower one. To place a third order above the upper one and under the same conditions would not be possible, because it would be too weak a form, quite unsuited to receive a crowning entablature adapted to the entire building.

The pilasters are usually so arranged that one pilaster is placed between two windows. The angle is strengthened by two pilasters. Windows of the principal story are larger and richer than those of the upper story. Their general forms are to be harmonized with spaces enclosed between pilasters. Different forms are employed; round-arched windows and angular pediments

produce a good effect in contrast with horizontal belts and cornices. When windows are set closer, it appears proper to decorate the upper story by pilasters and give it the effect of a gallery. The pediment-architraves of windows of the principal story form an effective contrast with such an upper story with simple forms of windows between the pilasters. For the angle, it is best to extend the lower rusticated masonry of the angle up beside the pilasters to the architrave as a pier, either plain or with flat losses. By the projection of the upper pilasters, the upper wall surface must be set back from the lower wall surface.

145. Use of Engaged and Free Columns.

If the treatment of the facade must produce an effect of strong relief and an imposing impression, it may have engaged or free columns in two stories (Fig. 202); but we must then abandon a severe organism in the facade. Between the columns are to be placed the windows as arched openings with archivolts, their keystones supporting the entablature. To suit this purpose, these require greater projection and caps. The impost caps of window arches may rest on small columns doubled in depth and with plain piers beside them. The columns then act as structural members and all forms of the order must receive their normal development. For free columns, it is necessary to break the entablature around them by at least half their upper diameter, since the keystone of the arch would otherwise require too great projection. Special difficulties arise in the treatment of the principal entablature, to crown the structure without burdening the upper order by its oppressiveness. This should terminate the facade in an unbroken horizontal line corresponding to the straight substructure. To fulfil these requirements, pier-like consoles are placed in a high frieze over each column and support a massive straight slab extending the entire length, on which the cornice rests. In order to avoid an unquiet outline at the angle, especially in case of free columns, the wall mass of the facade may project at the side as a wall pier; the various belt courses then extend to this and are carried across it as plain bands.

In accordance with the massiveness of the upper portions, such a facade requires a substructure with strong forms and bold masonry. It especially demands a strongly projecting base with large forms and a heavy cap with thick band, which has a continuous balustrade and forms an extended balcony in front of the principal story. Magnificent examples of this kind are found in later Venetian facades, especially of Pesaro and Rezzonico palaces by Longhena.

146. Use of a Single Colossal Order.

With a single order, a united and grand treatment of facade is possible with severe organic forms; yet this type of facade introduces conditions,

which can generally be fulfilled only in palaces (Fig. 203) and public buildings. To the dignified effect of the exterior must correspond the treatment of the interior. With such an order may be combined only a larger and a smaller story, so that it always produces the appearance of a great room extending through both, merely divided by a gallery. But if several stories with the usual window openings are to be combined with a single colossal order of engaged columns or pilasters, it would be easy to produce the effect of a previously existing colonnade, walled up later. The small details of window architraves are there in striking disproportion to the great details of the colossal order.

With grandeur of the facade must be contrasted strength and simplicity of substructure or ground story. Rusticated work is appropriate, either continuous, or only on piers beneath the pilasters or half columns, above this being a massive unbroken belt course. The substructure may also be opened as an arched portico when this is entirely finished in rusticated work. Pilasters or engaged columns may stand directly on the belt-course; they are generally placed on pedestals of the same height as the window sills. Pedestals receive a flat band of the width of the window sill; this would appear too weak beneath the massive bases.

The main division of surface between the pilasters or engaged columns should not be made below the upper third of its height. A delicate belt course with a broad band beneath is appropriate for this. The lower ^{surface is} therefore generally suited to a harmonious treatment of the windows. The projection of the finish of the windows depends on whether pilasters or engaged columns are placed beside them. With pilasters projecting one-sixth to one-fifth their width, the window finish if composed of engaged columns supporting pediments, may project very strongly, and pilasters may project still more. But between engaged columns and in recessed niche-like spaces, only the pediment can have a good effect in dividing the surface, with a balcony or panel below the window, set in a line with the bases of columns or pilasters; a strong projection of window finish would fill up the space too much and make it appear unquiet. Corinthian pilasters are best accompanied by narrow and plain wall strips beside them, which also extend along beneath the architrave in the same width, chiefly to detach base and capital from wall surface and to widen the slender and fluted pilaster to form a wall pier.

Since pilasters or engaged columns stand on a high substructure, the entablature in the ordinary form appears too small as a dominant member in contrast therewith, and it therefore requires a balustrade above, or an attic (Fig. 204) which may contain the windows of an upper story. Such a crowning member is always to be placed on a high base in order to make it visible above the prin-

cial entablature. The angles of the facade are treated with piers, doubled pilasters, or pilasters with engaged columns. With a series of colossal pilasters or columns, two-story or one-story parts are easily combined. For in the central portion of the facade, round arched windows may occupy the height of the entire order; the impost moulding may be extended to the wings as the window sill of a subordinate upper story.

147. Balconies and Bay Windows.

Balconies and bay windows remain for mention as special parts of the facade. The balcony is usually placed before the first upper story, the belt course projecting above consoles, and it is enclosed by a balustrade. The corbels are organically connected with the wall if they spring from prismatic blocks connected with the masonry, especially in rusticated work. The balustrade may consist of perforated slabs imitating wooden lattice after the antique, or of balusters between the angle pedestals. In order to avoid a heavy appearance, these angle pedestals should be as narrow as possible; they may be strengthened on two sides by half balusters. The bay window is really an enclosed structure on a balcony. It should be light, and graceful, and constructed with architectural forms, having small columns or pilasters at the angles. Harmony with the architecture of the wall is only to be attempted in its height. A bay window may extend through two stories if these are combined together in the treatment of the facade.

b. Horizontal Subdivision of the Facade.

148. Detached Buildings.

The centre of the building, or vertical axis of symmetry is taken as a starting point for the horizontal subdivision of the structure. By a balanced arrangement of parts about the centre and by its symmetry, the structure appears as if entirely complete in itself. If the building consists of a uniform mass, it is first to be decided in accordance with the interior, whether this is to be arranged about a central vertical axis or a horizontal axis. For the first, we may commence at a central axis of symmetry in the treatment of all facades; for the last, this only occurs on an entrance or principal facade. A pediment and the portal mark the centre, while treatment of the sides expresses the sequence of internal apartments or divisions.

149. Facades between Adjoining Buildings.

Special consideration is required by facades built between other structures, as usual in city residences. An endeavor always prevails to emphasize the axis of symmetry by treatment of the portal. This accenting of the centre may be increased by placing a balcony over the portal. Another symmetrical arrangement consists in grouping the windows, employing similar forms. A larger group comprises three or five windows, and may be separated by spac-

es from side groups or single windows on each side. The central group may become a complete loggia. To mark a clear division in groups, decoration of the stories by pilasters or columns is especially appropriate. Single supports may either indicate this division, or these may be set in pairs to terminate the wings and to separate them from the middle portion, while spaces for the windows are subdivided. (Fig. 205).

It frequently suits the division into rooms to place the chief entrance at one side of the facade instead of at the centre. To then obtain an axis of symmetry, it is unnecessary to repeat at the other side the doorway as a useless form. It is far better to emphasize the centre by a group of windows and balcony or bay window, balancing the doorway by a larger window. But for a door with a simple architrave, this is not at all necessary. Instead of the centre only, both wings might be accented by balconies or bay windows. Lack of symmetry with a door at one side is then easily compensated, and this may even lend to the facade a certain grace.

150. Buildings with Rooms of Unusual Height.

If a building contains rooms of unusual height, then for an organic treatment of plan and facade, larger rooms may be placed at the centre and subordinate ones in the wings. If the height of apartments in central portion equals a two-story arrangement in the wings, a common entablature may then extend over the entire facade. A slight projection of the central portion is always best, to emphasize its importance. A series of colossal pilasters or columns is suitable for combining the two stories at the sides with the great windows of the central portion in a single organism. The upper arrangement may be repeated in the substructure, so that the great windows of the central part correspond to great openings for portals, and the wings in two stories to the superposition of ground and mezzanine stories.

To produce an effective outline it is best to treat the central part as a separate architectural mass, making this higher than the wings (Fig. 206). It then receives a richer treatment than the latter and has larger forms. For the central portion, a columnar architecture with great arched windows, a free colonnade with pediment above, or compositions like triumphal arches are suitable. For contrast with the more open middle portion, the wings receive broader surfaces and more simple arrangement of pilasters. A great exedra or niche covered by half dome is sometimes a very effective form for the central part, or a portico covered by a tunnel vault. These forms require massive piers at each side, treated with pilasters or columns, the lower order supporting the impost moulding, the higher one supporting the entablature. Surfaces between them may have small niches with statues, etc. Such a central structure requires an attic above the main entablature, which may be a

pediment, or decorative sculpture (symmetrically arranged groups of figures, quadriga, etc.).

If such a building stands on a high substructure or basement, this should have uniform coursing and treatment to form a common base for the upper portion. At its centre will be a great portal, or an external staircase to the upper story. With a raised and projecting central portion, the wings should not be made too short, to not appear too insignificant in dimensions, or be entirely concealed by the central part if viewed obliquely. Hence slight projection of the central part is recommended, about one-sixth to one-fourth its width; the wings will be in good proportion if their lengths approximately equal this. With greater length of wings, it is proper to add to them special angle pavilions (towers, etc.); these usually have a vertical subdivision harmonizing with the wings, and the main entablatures are at the same height; compared with the central part, their lengths must be less than their heights.

151. Arrangement of Central Mass of Building.

The richest subdivision of an architectural structure occurs, when the parts of the building are grouped along its main axis and around a high central mass. This central mass is set back from principal facade, usually flanked on both sides by courts, and requires on its upper parts a treatment calculated for being viewed at a considerable distance. A dome first requires a high and undivided substructure, to become visible from below and over the surrounding masses of the building. Decorative architectural members, like columns, pilasters, cornices, etc., should there be of smaller dimensions, than on other parts of the building, and should have the greatest simplicity of details. Central masses of rectangular plan, cubical or prismatic in form, slightly subdivided and only crowned by an entablature or pediment, moderately predominant over the principal facade. As external surfaces of separate masses, side facades should likewise be symmetrically arranged; when quite distant from the central mass of the building, correspondence to it is not necessary.

152. Irregular Grouping of Design.

For buildings with irregular surroundings or in the open country, rigidly symmetrical arrangement may be omitted if the purpose of the building suits this. Yet a central mass must always predominate over the parts, and the building must balance in its masses. One wing may have a form like a tower, the other being treated as a horizontal addition. In country houses such grouping affords a free plan and harmony with the landscape. Monumental structures with irregular grouping may have a very pleasing effect, if surroundings and the form of site give opportunity therefor, as at the

Erechtheum in Athens.

Chapter 2. Internal Architecture.

153. General.

The essential purpose of all architectural creation is to produce rooms for the different requirements of human society (Art. 92). The architectural treatment of the room is therefore placed on an equality with that of the exterior, if the building is to be a complete work of art. As in facades, so in the architectural treatment of rooms, we start from their construction. The form of ceiling is especially determinative, since by this fixes the subdivision of the wall. But the interior requires for its treatment some essentials differing from that of the exterior. External architecture must require a character of durability and stability. This is produced by a severely architectural elevation where the material used in the construction appears undisguised by the decorative form and requires uniform treatment. But in the interior, comfort, elegance, and richness, attract persons; works of the sister arts of Sculpture and Painting are suitably placed therein and combine with the architecture; the entire decoration produces a harmony, which corresponds to the intellectual meaning. Forms and materials required for the construction are unsuitable for this purpose. Strong and earnest forms on the exterior appear heavy and rude in the interior. The room requires a decorative covering, which permits the construction to appear in better materials, made attractive by artistic treatment and coloring, or an independent lighter ideal construction is executed. Thus different materials appear in the decoration in combination with each other, each requiring its own technical treatment and forms. Uniformity in forms, as on the exterior of a building of uniform materials, cannot usually appear in the interior. The room serves purposes more or less material, themselves requiring the arrangement of special furniture. The internal architecture must combine with this furniture, so that the latter may appear a necessary part of the whole. Rising above purely material purposes, the possibility increases for giving the room a strictly architectural treatment, as in buildings for divine worship, museums, city halls, etc.

A difference is always made between architectural forms used on the exterior and in the interior of a building. On the exterior, relief of forms is increased by direct light, in the interior, light is usually insufficient for clearly seeing a form of a single color; polychromatic treatment must therefore aid us, especially in marking the outlines, and with a difference of color between background and ornament. On the exterior, forms must be designed for being seen from a greater distance and a direct view, therefore having a bolder and more massive character. But in the interior, they are

only viewed near at hand, chiefly obliquely from beneath; their profiling must therefore be more refined, details more delicate and intended to be seen from below.

The kind of ceiling permits forms of rooms to be divided into two classes, those with horizontal ceilings, and those with vaults. In the first are considered various methods of covering the walls and of treating the ceiling; in the second, modes of subdividing rooms and the decorations suitable for different forms of vaults.

a. Rooms with Horizontal Ceilings.

154. Base and Cornice of Wall.

Horizontal ceilings exert only vertical pressure on the walls, which then only require thickness sufficient for this pressure and for their own stability. The treatment of the wall may then be uniform, or it may be replaced by a colonnade or arcade, or be pierced by doors and windows, so long as parts above these openings are able to support their loads. Every treatment for walls must first have at bottom a base connecting them with the floor, and a cornice at top. The base usually changes into the lower wall wainscoting of hard materials, a dado or paneling, which must be durable, as the lower part of the wall is exposed to injury. Stone and wood are suitable materials for this covering. Lining with stone slabs is especially appropriate with antique wall decorations. Stone slabs of rectangular form are then fixed above the base mouldings and are bordered at top by a flat band or belt-course. Wooden paneling also takes a special form at the base, and requires framework and rectangular panels. A moulded cap at top with a slightly projecting rounded profile forms a transition to the middle wall surface.

The surface of the wall require forms above it to both crown it and make a transition to the ceiling. The cornice belongs to the wall covering and has a frieze with ascending ornaments or figures. The cornice is the transition to the horizontal ceiling, and to express its function as a bearing form, it must appear as a course structurally united with the wall and corbelled out from it.

155. Wall Tapestries.

In the decoration of wall surfaces, their function in enclosing the room should chiefly be expressed. Ornamental forms are therefore borrowed from the oldest form of enclosure, merely an inclosing by suspended tapestries. Since the wall is built of solid materials, a covering of tapestry formed the wall decoration during many periods of civilization. In the Graeco-Roman period, these tapestries with inwrought or painted figures played the chief part in the decoration of walls. During the entire Renaissance period, cost-

ly wall tapestries were preferred for churches and palaces on festal occasions. Perfected technical skill has now substituted cheaper manufacturing processes for earlier hand work, and has invented various substitutes for the costly wall tapestries, and these have been very extensively used in consequence of their cheapness.

In accordance with oriental traditions, wall tapestry has a uniformly repeated ornament or motive, but according to antique and Renaissance ideas, it should have within a wide border representations of figures or landscapes, or be designed on architectural principles. In the decoration of tapestry by the first method, it is important that this should be based on an easily recognizable geometrical form, like vertical stripes, squares, polygons, etc. Yet these forms must not be enclosed by geometrical lines, but be represented by ornamental shapes, which in their general effect produce the geometrical form. Such a surface pattern is appropriate when the wall forms a background for movable objects. The decoration of the wall must then be subordinate to objects before it; as a background, it must have a quiet and full tone and exhibit in different parts of the design no great diversity in color. A good effect may be obtained by patterns, where design and ground are kept in the same color tone, differing only in degree of depth. Tapestries with ornamental figures (Fig. 207) are used for enclosed spaces, and must therefore be suited for the wall surfaces to be decorated. The corners and centre of each border are emphasized by small panels with little figures, medallions, etc. Figures and landscapes are used in picturesque composition, a purely ornamental expression must be arranged so that clear and appropriatedivision of surfaces and masses may result. The centre is always occupied by a large ornament, as by a graceful shrine with a figure, by a small statue, etc., whose enclosure combines with the other decoration. Shields, medallions, vases, etc., may also form centres of the ornamentation, which covers the surface with slender candelabra, arabesques, and festoons. The border should decidedly ride from the panel surface in its color tone. In Italian tapestries the ornament of border is usually dark on light ground, and conversely the decoration of the surface is light on dark ground; for French tapestries, the border is mostly dark with surface ornament on light ground.

153. Mural Painting.

Painting walls is directly connected with covering them by tapestries; older forms directly imitate the latter, and in its later development, the important laws of style borrowed from wall tapestries are strictly retained.

Each representation in tapestry has acquired a conventionalized form and combination of colors, so that the surface is never disguised, and this always

appears as a covering. Thus conventional wall painting strives less for realistic truth to nature in figures or landscapes, than to appear as a surface decoration by severe outlines and simple broad coloring with a perfected artistic effect. Early Grecian mural paintings in temples and public halls were imperfectly imitated in paintings on vases and by the latter we may learn the severely conventionalized and decorative character of the wall paintings. Even borders of pictures on vases are not suited to the form of vase, but indicate the mode of enclosing such wall paintings, and suggest that all mural painting then firmly retained the idea of tapestry covering.

157. M Pompeian Mural Painting.

A peculiar form of decorative painting was developed in later antique art. It is usually termed "Pompeian" as it chiefly became known in the cities of Campania buried by Vesuvius, of which Pompeii was the most important. In this mode of ornamental painting there was an endeavor to subdivide the wall surface and apparently enlarge it by making a slight architectural frame-work, suspended tapestries and perspective views forming the enclosure of the room. This is to be regarded as a pleasing fancy of the imagination, rather than as an actual deception, because not a realistic imitation of actually existing objects, but a sportive representation of light and graceful forms having a purely ideal existence.

Such a decoration (Fig. 208) is usually composed as follows. The lowest part is occupied by a dado of dark or black color, subdivided by lines and bands and containing in its panels, views, fishes swimming, birds, or plants. From this base rises a light architectural structure, enclosing the larger central space, by its perspective depth frequently appearing as a kind of shrine. This enclosure has a suspended tapestry as its motive, with a rich border and a large picture with several figures. At the sides of the middle space are narrow views with architectural forms drawn in perspective. Side panels also represent suspended tapestries within light borders and are more simply decorated, having as ornament an ascending figure or medallion on tapestry ground. The supports of the architectural frame-work are slender columns, candelabra, or reeds, receiving a correspondingly slight entablature, frequently broken and is decorated by fanciful ornaments and additions. The entire architecture appears as if designed in metal and is usually of a golden color; deep red is preferred for the suspended tapestry, though other colors were likewise employed. Above the portion of the wall already described is a deep frieze, usually treated as if transparent. Upon the cap of the base stand shrines, candelabra, and slender hermes columns, which partly continue the lower subdivision of the wall, and are partly the upper termination of the wall surfaces, connected by light

festoons, bands and arabesques. The slight architecture of this transparent frieze is ornamented by dancing figures, winged genii, and fanciful beings of all kinds. Panels and open spaces are shown in perspective and do not at all harmonize, but relate to a near observer; the various parts are drawn with different points of sight. This wall decoration apparently enlarges small rooms by the gracefulness of its forms and by its views; but it requires the walls to be entirely unbroken, and with our custom of filling living rooms with furniture it is applicable in only few cases.

The Renaissance made no extensive use of mural painting as Roman antiquity as tapestries were preferred in decorating the finest apartments. When in the 15th and 16th centuries walls were ornamented by decorative painting, the modes of subdivision of walls and the ornamental forms of antique wall decorations were employed as far as possible. Favorite motives were the paintings in the Golden House of Nero beneath the Baths of Titus. Moderate use was made of perspective recesses in architecture, though they were correctly represented. Ornamental treatment of tapestries was also later very influential in mural painting. Architecture was replaced by a free structure with ornamental forms, animated by the most varied accessory figures.

158. Wooden Wainscoting.

Covering walls with wainscoting occurred in the earliest antiquity in Phoenicia. Biblical narratives of the building of Solomon's Temple and Palace are equally applicable to Phoenician architecture. Classic antiquity seldom used this mode of covering walls. Remains of dwellings scarcely permit us anywhere to assume wooden paneling, nor do ancient writers say anything on this point. But during the Middle Ages and north of the Alps, wainscoting was extensively used in houses, monasteries, and castles. In the 14th and 15th centuries joinery was separated from carpentry, and wainscoting changed from joining together narrow matched boards to a framework with inserted panels. In the Renaissance period, preference existed for wainscoting, especially in Upper Italy, shown by fine examples in sacristies, choirs, and apartments of palaces. Rich and finely developed forms of paneling were transmitted to Southern Germany and to France, assuming a national character in both places.

In constructing wainscoting, peculiarities of wood must be considered. It changes slightly in length, but its width continually varies in damp or dry air. This requires the construction of a framework of small width with inserted panels, which can move slightly within their spaces. The frame is frequently composed of doubled pieces, so that when wide, shrinking or swelling may be possible in its separate pieces.

The wainscoting of the wall is usually divided in two parts in height, a base with oblong horizontal panels, and the wainscoting proper with its high

panels. The lower portion is of simple form, but has a separate base as a wide band and a cap, which projects little and has a rounded profile. The upper portion may have ornamental pilasters or engaged columns between panels to support the cornice of the wall. (Fig. 209). In accordance with the smaller scale, the forms of the columnar orders are simplified and have sharp and angular shapes, so as to appear sufficiently prominent in the dark color of the wood. Among decorated mouldings, the large egg-and-dart moulding and delicate dentil bands have especially good effect; the leaf moulding is executed with simple incisions. Besides pilasters, the panels are decorated by enclosing bands, with a leaf moulding inside.

Inlaid work or intarsia in wood is a favorite method for decorating panels. The use of veneers in different colors has the best effect in flat ornament for the intarsia. The Italian Renaissance understood how to fill each surface in great variety with ornaments of beautiful and pleasing form. Most ornament consists of conventionally treated plant forms, growing upwards from a vase or candelabrum, and extending in beautifully curved scrolls. The centre of the surface is marked by a plate, shield, or similar object, around which are grouped the principal masses of ornament, of interlaced motives, and small figures, in a regular way. This produces a clear composition with alternation of broad and delicate forms. In contrast to flat ornament of the panels, the framework may be decorated by bold sculptured ornaments. Leaf mouldings or egg-and-dart mouldings enclose them; the narrow surrounding frame has an interwoven band in low relief; pilasters are fluted, or their surfaces are sunken within a narrow border and decorated by carved ornament. The frieze of the entablature is also an appropriate place for relief ornament.

The German Renaissance received from Italy only the columnar orders of the High Renaissance Period. It employed these in its own way, partly combining them with existing native forms, partly extending them in the same spirit with new forms in bold relief. The ornament is ruder than that of Italian and is frequently composed of carved and perforated cartouches and metal-work. The lower third of pilasters and engaged columns is usually decorated by ornament like metal work, but the upper part is left smooth. The pilasters took a new form, borrowed from furniture, being diminished downwards with bold band-like ornament forms below its middle (Fig. 210). Such supports were also placed on elegant pedestals above the base of the wall. The pilaster receives as background a wall-strip having the width of its extreme projections. The frieze of the entablature generally has consoles supporting the widely projecting and delicately profiled cornice. The panelling of the walls is treated in the most varied ways and boldly framed. Motives of the panels are

woods of handsome color, flat niches, arched panels with inlaid ornament, etc. Bold contrasts of color were sought in the paneling; structural portions are usually dark and consist of better woods, panels being light with a ground of beautiful grain.

Wooden paneling does not usually occupy the entire height of the wall, but leaves a deep unbroken frieze at top, decorated by painting or covered by painting tapestry. When the paneling covers the entire wall, paintings on wood panels or canvas are properly inserted in its upper portion instead of wooden panels. Partial gilding of the wood is necessary to set off deep and full colors of oil paintings, especially in the framework. Then intarsias also occur in the panels between the pictures and the base.

159. Marble Wainscoting.

Covering the wall with marble slabs succeeds wooden paneling for its better appearance. Even if a framework with panels is not formed, harmony of colors requires the larger slabs of varied coloring to be enclosed by bands of quiet tone and usually dark in color. The method of fixing this wall covering in place makes this arrangement suitable, large slabs being fixed by cramps sunk in their edges, the narrow bands being cemented in between them. Outer surface of slabs, of inlaid portions and of bands, are usually set in the same plane, because they may then be polished together. Only such bands project, which are to produce an architectural subdivision of the wall, and these receive a corresponding profile. Since most kinds of marble have strongly broken tones of color, it is necessary to arrange them in complementary colors, to heighten this coloring. Slabs, when veined in various colors, are separated from enclosing parts by white lines, that the eye may distinctly separate the colors. Variegated marble, sculptured members, like capitals, bases, and cornices, when executed in white marble with some gilding produce splendid effect.

Marble wainscoting (Fig. 211) found its richest development and most extended use in Alexandrian and Roman periods. Such decorations are imitated in Pompeian paintings (Temple of Jupiter, Basilica, Older Houses). According to Roman authors, luxury was carried to a high point under the earlier Caesars in covering walls. The covering of the lower part of the wall in the interior of the Pantheon remains from this era. In Early Christian and Byzantine periods, churches were veneered in the antique manner with marbles of different colors, mostly taken from ancient monuments; yet the broad surfaces of the antique wainscoting frequently give place to mosaics. The Renaissance invented imitation of genuine marble in stucco marble, which required much time and labor, but which is sometimes preferred for its uniform texture to real marble, where some veins are usually soft. The later Renaissance employ-

ed this stucco marble profusely, especially in Jesuit churches, and treated wall spaces with fanciful forms. Together with genuine marble, stucco marble is much used now, and properly so for decorating entrance halls, stairways and state apartments.

130. Treatment of Ceiling.

Treatment of the ceiling is generally independent of that of the walls, and in the best examples in the different art epochs the most diverse forms of ceilings occur with the different modes of treating walls. The ceiling may either have the construction visible and treated ornamentally, or it may be entirely concealed and covered by a decorative form, like an ideal structural framework or a stretched awning or netting, which transforms the ceiling into light, freely soaring and beautifully subdivided forms.

131. Structural Ceiling with Wooden Beams.

The simplest structural form of ceiling consists of uniformly spaced beams covered by a floor of boards. The antique ceiling of stone beams is merely a translation of a wooden beam ceiling into stone. Pompeian paintings prove that the wooden beam ceilings of antiquity have their structural elements left visible. This was the only method of covering rooms in the middle ages, and such ceilings were richly colored and gilded for state apartments. In the earlier Renaissance period, this was ornamentally treated in the new form of the style; but from the 18th century, it was supplanted by the various forms of panels.

Decorative treatment of such a ceiling (Fig. 212) consists in making prominent the functions of the different parts. The beams support the roof and their lower surfaces are ornamented by stretched bands or interlaced work, to make apparent the horizontal enclosing of the room. A cyma placed at the top of the walls is a symbol of the support of the ceiling above it. The latter may be subdivided in small panels by enclosing bands, each decorated by a symbol of suspension in form of a star, a rosette, or similar ornament. Beams are laid on the wall and either rest on a continuous cornice, or on consoles. The first is suitable when the wall is lined with stone, this cornice then being also of stone as a part of the wall, and treated like an architrave. For other treatment of walls, especially with tapestries or paintings on its upper part, it is sufficient if supports of beams are wooden corbels or consoles. It is proper in large rooms to rest the beams supporting the ceiling on heavy girders or main beams (Fig. 213). If these are placed at moderate distances, have supporting cornices along their sides, and the ceiling surface between small beams resting on them are panelled by enclosing bands, this produces a dignified and highly ornamental form of ceiling, which may be decorated by painted and sculptured ornaments, producing a very rich effect. It

here appears necessary to suggest the subdivision of the ceiling in the frieze of the wall and to place main beams on heavy consoles. As for painting the structural wooden beam ceiling, in the best ancient examples the colors of wood are seldom imitated, a combination of colors being generally executed with purely decorative views; the beams and the bands enclosing panels being light, the surface of the ceiling having a dark tone, from which the colored or gilded ornament clearly detaches itself.

132. Visible Roof Trusses.

In buildings containing large rooms, the frame of the roof may be left visible, forming both ceiling and roof. But the construction of the trusses must then be very simple and of monumental dignity, so that as strong triangles supporting the inclined ceiling, they may appear to the eye as sufficient. Decoration of these ceilings or roofs (Fig. 214) has the same requirements as horizontal beam ceilings. Purlins appear as large beams and rafters as light timbers supporting a covering of boards, that may be paneled by planting on bands. The structural parts should be painted light and ceiling surfaces dark. The use of visible framed roofs is not certain in classic antiquity. Yet it harmonizes with the structural spirit of Grecian architecture, as Schinkel and Klenze have shown by architectural designs. In the early middle ages, basilicas were generally covered in this way, which was sometimes so richly treated, that a splendid horizontal ceiling might have been constructed at the same cost. The framed roofs of San Miniato at Florence and of Cathedral at Monreale near Palermo are classical examples.

133. Ceiling with Coffers.

The coffered ceiling of wood with nearly square panels or coffers cannot be regarded as structural, but only as a decorative covering. Since beams are employed to enclose coffers in one direction, light boxes of boards are set in the other between the beams, to complete the paneling. But the entire system of coffers usually consists of light boxes of boards and is suspended, being ornamented by bands and rosettes. Yet coffering produces an impression of an ideal construction. The intersecting beams are represented by the soffits of the dividing members as a strong framework, above which the coffers are two or three recesses above each other (Fig. 215). The upper recesses are reductions of the lower form, and with their diminished size, the enclosing mouldings are also reduced. At the center of the coffer is a suspended ornament or a large conventionalized flower or rosette. For larger surfaces, scroll ornaments may spring from the rosette and spread over the ground of the coffer.

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basilicas erected during the Renaissance period frequently have all the details of the Corinthian entablature represented in the beams enclosing the recesses. Five to seven coffers generally compose the width of the ceiling; a greater number appears monotonous. Transition to the wall is effected by a cornice, usually consisting of an angle with cymas above and beneath; the angle is frequently replaced by a row of dentils. The complete width of the soffit between the coffers likewise extends along beside this cornice.

The rich sculptured form of such a ceiling most clearly appears when but few colors are employed thereon. White and gold are appropriate for enclosing parts, with blue or red for background of the rosettes and of the soffits. With deeper and stronger coloring of walls, the ceiling produces the most magnificent effect, when all the ornament and framework is in gold, the ground of the coffers and the soffits being blue. If the wall has a frieze below a ceiling with large coffers, the divisions of the ceiling should be short flat pilasters, decorated by figures in relief, candelabra, or suspended wreaths of fruits (Fig. 213).

Instead of extending a uniform series of coffers over the entire ceiling, a larger panel may be arranged at its center, suitable for receiving an important picture; smaller panels enclose the central space (Fig. 217) with special shapes located at the centres of the sides and at the angles. The same principle always forms the basis of such a coffered ceiling; a series of strong beams are characterized as under stress and forms the structural framework between which recessed surfaces appear as panels decorating by ornaments or figures. Too great fancifulness in the paneling is not permissible, because the construction is thereby made impossible.

164. Banded Ceilings.

Requirements are different for ceilings, where the surface of the covering above a series of beams is subdivided by slightly projecting strips. Such a division does not concern the construction, but appears as a light network stretched over the ceiling. To such decoration applies only the law (Fig. 218) that the centre should be made prominent by a larger panel with a rosette, figure or similar motive. While a ceiling with deep coffers is appropriate for high and large rooms, banded ceilings would be suitable for small rooms of less height. The natural color of the wood then usually forms the ground tone of the decoration, which may consist of flat ornament with a partial painting and gilding of the wood. Transition to the wall is formed by a delicately profiled cornice. Such ceilings harmonize well with wainscoted walls. The wainscoting may then extend to the ceiling and connect with it by the cornice.

165. Painted Ceilings.

Forms of ceilings previously treated contrast with those consisting of decorations of stucco-work. The painting of the ceiling should cause the upper surface of the room to appear like a stretched canvass. Therefore this surface receives a broad bordering band and an ornamental center, which represents free suspension and approximates to the ornamental forms of textile art. Bands that divide and enclose the surface may be painted as flat ornaments, or be raised in low relief. Painted ornament in the spaces may itself be slightly shaded, but must have cast shadows on the surfaces. Only separately enclosed pictures may be treated with picturesque freedom, since these represent on the principal parts of the surface special decorations (Fig. 219).

Such ceiling decorations are usually executed on a plastering of lime or plaster of Paris. It is easy to combine painting with low relief; the bordering forms of the dividing bands may have sharply raised forms, like cymas and beaded astragals, and be distinctly raised from the background by colored bands adjacent to it. The delicate gray shading produced on such relief mouldings by side lights makes a pleasing contrast to the full colors of the bands of ornament.

As for division of the surfaces of such ceilings, the center is always made prominent by a larger panel, surrounded by smaller panels at its sides and angles. Between them connecting bands of ornament subdivide the surfaces so far as necessary. The form of surface of ceiling naturally determines arrangement and shape of the panels, and a generally applicable rule can scarcely be given. The easiest arrangement is always the square (Fig. 220). Ornaments in intermediate spaces may be plant forms, candelabra, small figures, garlands, etc., and should always extend from the outer border inward, as if the ceiling rises at the center and the ornaments grow upwards; this arrangement is also conveniently viewed from below. Transition to the wall may be by a delicately profiled cornice; yet a larger cavetto is appropriate, since this form corresponds to the lightness of the stretched canvass and apparently excludes all loading. Beneath such a form of ceiling, the wall frieze is most readily decorated by arabesques and by inserting large paintings in the architectural order beneath them. The Italian Renaissance treated such a frieze decoration richly and elegantly, for the free upper wall surface is the most visible place for pleasing representations of figures and for decorations.

186. Architraves of Doors.

Architraves of doors within the building should be lighter and of more elegant form, than those on its exterior. The pediment caps have smaller dimensions, since they are chiefly viewed obliquely from below. The Renaissance almost always constructed the door jambs and soffits of stone, and in the earlier period gave to them a wide decorated band (Doorways in Palace of

Urbino). Large doorways are finished with pilasters or columns supporting an entablature. A free decorative treatment of supporting forms is suitable here. Pilasters may change into Hermes figures and columns may be decorated by rings, rows of leaves, or incisions, in the most varied ways. A crowning ornament is also placed as a decoration over the pediment cap. An angular or curved pediment may either be broken at the center to receive a bust or vase, or above the horizontal cornice of the cap may be placed special ornaments at ends and centre, connected by ornamented volutes or scrolls. Doors are usually of wood, only being of bronze in rare state doorways, and they are composed of framework and panels. The paneling depends upon the style and character of the adjacent architecture. Uniform square panels with rosettes on the panels and with disks or knobs on intersections of frame are appropriate for monumental doors; division into small and large panels of different forms decorated by ornaments or figures produces an elegant impression, and harmonizes with varied ornamentation of the room.

137. Large Rooms.

Large rooms require a clearly arranged architecture, which divides the wall and appears as a structural framework for its decorative covering. This purpose is most simply fulfilled by a series of pilasters forming two orders, if the room extends through two stories. The upper order is kept low and no frieze is assigned to its entablature. The arrangement of the pilasters produces a rhythmical division of the intervals, adapted to any particular form of the apartment. Effective contrast in decoration of the intervals are obtained by covering the lower ones by ornamental forms or tapestries, the upper ones having figures. The ceiling must in its division accord with the arrangement of the pilasters; supporting beams must correspond to the separate supports.

138. Basilican Designs.

The special purpose and especially the necessary width may require the room to take the form of a basilica. This essentially consists of a high central space or aisle with colonnades or arcades along each side opening into lower rooms or side aisles, and lighted by windows in its sides above these. Side aisles may receive light from the middle aisle, or external windows may be in the side walls. The light falls in the middle aisle from above and is very satisfactory for the general effect and for the decorations. Division into longitudinal aisles makes possible a great width with proportionally small spans to be covered, and with its varied heights and the arrangement of its columns, it produces a rich perspective effect. In decorating the interior, it is necessary to make the upper portion of the center aisle as light as possible, so as to not produce a heavy effect above the rows of

columns. The adjacent roofs of side aisles require a rather high wall above the spandrels of the arches, and this may be decorated inside by a deep sculptured frieze. The upper walls above this have light pilasters, supporting the high suspended ceiling with coffers; windows in the intervals have graceful architraves, surfaces are decorated by tapestry patterns. In contrast to this light decoration of the upper portion, the side aisles may be veneered with marble or stucco, so that the lower story appears as if entirely executed in stone. Ceilings of side aisles may have a massive character with large beams, serving to tie the walls together.

169. Rooms with Galleries.

These (Fig. 221) usually have two colonnades or arcades above each other. Ratio of height of lower to upper order is then taken 3 : 2 or 4 : 3. Practical uses of such an apartment usually require wide spacing of the columns. The straight entablature is to be made as if constructed of wood. Cap blocks with consoles at each side may be set over the capitals and produce a good effect, materially reducing free span of the architrave beam. Rooms with galleries may also have a basilican plan, if a third story with pilasters be provided; yet this produces a rather weak support for the upper walls. The following arrangement has a monumental effect: colossal columns directly support the walls of the clear story, its windows being placed between low pilasters and are wider than high: behind the columns and at less than two-thirds their height, galleries are supported by inserted pilasters or corbels. This combination of the gallery with colossal columns will not have a perfectly satisfactory effect, and the gallery will take the character of a wooden enclosure; yet this arrangement produces a dignified general effect in the room, and is strong construction.

170. Halls of Semicircular Plan.

With rooms having galleries belong semicircular assembly halls, which contain above a closed corridor a gallery open to the interior through colonnades or arcades. A large recess or niche is usually arranged in the straight wall for the tribune or platform. Such rooms afford surfaces very appropriate for beautiful decorative treatment. Above concentric rows of seats, a frieze with figures may be arranged on the continuous wall. The semicircular arch of the niche is suitable for a larger figure of especial importance. Beside the niche are surfaces for varied decoration and sculptured ornament. The ceiling may be painted to represent a stretched and richly ornamented canvass.

b. Rooms with Vaulted Ceilings.

171. General.

For the construction of plane ceilings and for covering them, the most

varied materials are used and require corresponding variety in decorative treatment. But in vaulted rooms, all surfaces of the ceiling are constructed of the same building materials. The ornamental treatment may then show a certain harmony in the conventional forms of the different parts. Tapestry coverings, wooden wainscoting, etc., always appear as extraneous additions in vaulted rooms; the proper structural and decorative material is stone and similar materials. But since these materials are treated in varied forms, are painted, or may be used as veneering, this varied treatment of similar materials produces an abundance of ornamental forms.

The general arrangement of the decoration is first fixed by the form of vault and by the construction of the wall. Vaults do not act merely as vertical loads, but are covering forms with thrusts, requiring abutments or buttresses. But the Antique and the Renaissance never left this construction externally exposed, but always connected it with the treatment of the room. This appears necessary and it makes the solution of the statical problem visible in the subdivision of the masses. The architectural and ornamental treatment then undertakes to clothe ^{with} an ideal construction the supporting masses and those covering the room, with which is always combined in monumental architecture the expression of great weight, this ideal construction indicating only contrast between support and load, and by its grace and lightness of forms causing the weight concealed behind it to be forgotten.

Vaults are decoratively considered as homogeneous stiff shells. Their decoration is then to be uniform, like that of a ceiling curved in different forms. Like the plane ceiling, it is composed of stiff arches or ribs, forming a structural framework, with spaces or panels lying between them, which may be considered as openings. The enclosing wall consists of supporting piers and of screen walls set between them, expressing aspiration and support, and the enclosure of space.

178. Tunnel Vaults.

The tunnel vault lays its load and its thrust on the side walls, while the end walls merely enclose the room. The side walls require for the thrust a much greater thickness, than would be necessary to support the thrust alone. They fulfil their purpose just as well if divided into isolated deep piers, which below the springing lines are again connected by arches. Spaces between the piers form extensions of the principal room like niches or chapels. The walls at the ends may be freely divided into piers or colonnades, or be filled with large doorways and windows. Tunnel vaults are either built of uniform thickness, as in brickwork, or composed of separate supporting transverse arches of cut stone with slabs or light masonry placed between them. In the first, side walls may be divided into piers and niches at pleasure, but in the last,

supporting piers must be set under the arches of the vault (Fig. 222).

The forms of construction described suggest the mode of decorating surfaces of vaults. The tunnel vault has a uniform decoration over its entire surface, appearing in many variations, from painted network or foliage-like decoration to a series of deep coffers. Elegant painted vaults are found in the baths at Pompeii (repeatedly interwoven bands enclose panels of different dimensions, in which soar small figures), in Roman tombs (usually combined with fine stucco work), and Renaissance villas (Villa of Pope Julius, arched corridor with delicate lattices and scrolls of foliage). Coffers (Fig. 223) are treated on the same primary principle as plane ceilings, and may have square or polygonal coffers alternating with small square ones. In Roman architecture, only arches and horizontal beams were of brickwork, wooden forms being set on the centering to form the coffers, this portion of the vault being of concrete. (Temple of Venus and Roma; Basilica of Constantine; Rome). A row of coffers is always found at the crown of the vault, usually with a larger panel at the center (The ornamental arrangement of such panels in vaults of triumphal arches permits the assumption of ceiling lights in vaults of temples). The number of coffers in the width is 7 to 15, according to dimensions of the vault.

A strongly projecting cornice separates the wall and vault. Its forms are derived from those of the Ionic or Corinthian entablature. Its projection conceals from below a large part of the surface above it. This indicates that decoration of the vault must commence above a plain band of the same depth as the cornice, and that the vault should be stilted accordingly. Subdivision of walls below the springing may be according to different systems:— 1. In solid walls, separate niches may be arranged with pediments and columns, a continuous frieze extending above them. 2. If the wall be interrupted by large niches covered by tunnel vaults or half domes, free columns may be set before the piers, their entablature at the same time forming the cornice for the vaults over the niches. Above the columns are suitable places for statues. Lighting is best effected by large semicircular windows in walls at ends of vaults.

Different antique structures exhibit a structural and decorative development of tunnel vault in cut stone, that recalls stone beam ceilings of temples. Strong supporting transverse arches have sections like beams bent into a semicircle; on these are set closely large moulded stone slabs. Such a construction produces a monumental impression in accordance with the material, yet the arches project strongly, and when viewed obliquely, conceal a large part of the slabs and appear monotonous by repetition. The Renaissance treated tunnel vaults generally in accordance with these principles, but proceeded in a

purely decorative way (Figs. 224, 225). Transverse arches are flat, are decorated by bands on their lower surfaces and by cymas on their sides; the slabs have large panels low mouldings, and consist of framework and panels according to the structural principle. The entire ornamentation represents ideally a light curved flat ceiling, or perhaps a bronze decoration of the vault. This decoration of vaults is intimately connected with the architecture of the longitudinal walls, subdivided into separate parts. Pilasters are set under the arches and are even in pairs, to support a wide paneled arch. The light character of the intermediate vaulting introduces intersecting vaults with windows over the arched openings or chapels along the sides. Such architecture affords good lighting for the rooms and produces great freedom and variety in decorative treatment. Large vaulted Renaissance churches afford excellent examples. The strong buttresses of tunnel vaults permit the formation of side rooms or chapels, again covered by tunnel vaults at right angles to the principal one, by groined, or by welsh-groined vaults.

In small rooms lighted at their ends, tunnel vaults may be set on colonnades or arcades, the thrust being transmitted through the ceiling of the side passage to the outer wall. With light and graceful decoration of the vaults, such rooms produce a rich and elegant impression (Fig. 226). We might give to tunnel vaults over large flat rooms a flat elliptical form. A varied paneling with flat enclosing borders should be most suitable as decoration, to produce an impression of great lightness in ornamental treatment, like the construction. Such an example is supplied in the magnificent ceiling of the Library of St. Mark in Venice, Fig. 227, decorated by paintings by Paul Veronese.

The inclined tunnel vault is used over stairways. Decorative transverse arches are not placed at right angles to the axis, but must always be set vertically. Since oblique intersections with longitudinal bands result, scrolls of leaves and fruits are most appropriate for ornamenting the entire visible framework, giving the vault a very light effect, making imperfections in subdivision not prominent. A magnificent example is found in the Scala d'oro in the Doge's Palace at Venice (Figs. 228, 229). The festoons are white on gold ground and the enclosing cymas, etc., are partly white with gold framework. Large spaces on each side contain colored figures, those in the middle have white reliefs on gold ground; long bands have colored ornaments on light ground, and small squares are filled with reliefs on gold ground. On account of the ratio of length to the small width of the stairway, the irregular treatment of the wall surfaces is not easily perceived, since one views the whole as foreshortened.

While the entire length of the tunnel vault rests on abutments, the groined vault is the intersection of two tunnel vaults, only resting at four points on supporting piers. Its pressure first loads the four groins or ribs extending diagonally between the abutments, and it is transmitted by these groin arches to the piers. The decoration is closely connected with these groins, which are considered as principal lines; the vaulted compartments are regarded as uniform surfaces between the groins. The groins or ribs are first ornamented by foliage scrolls or similar forms in relief, along their sides extending cymas or beaded astragals as a transition to the surfaces of the vault. In the middle of the vault may be placed a rosette (Fig. 230), or a figure in a circular or polygonal frame. Decoration of intermediate surfaces produces simple forms, if at the centre of each triangle be placed a circular or pentagonal panel containing a figure. The direction of the object is from the outside towards the center; the angles are filled by ornament extending from the springings. In contrast to the decoration of the arches, the entire ornamentation of these surfaces may be either by painting or be in low relief, appearing as light tapestries or ornamental network stretched between foliage scrolls.

In a series of groin vaults the bays are usually separated by flat panelled transverse arches. Yet the compartments of the vault may be joined and decorated together. Large square panels may then be surrounded by smaller polygons and produce a good effect, for they appear in continuous straight lines as viewed lengthwise the vault.

Abutments must be massive piers, capable of resisting both vertical pressure and the thrust. Inside them, projecting pilasters with entablatures receive transverse arches and ribs of the vault, permitting the observer to forget the thrust that acts sidewise. If free columns with an entablature are set beneath the springing of the vault and before the pilasters, merely appearing to support the vault, then according to the light and decoration of the vault, the supporting forms will have a character of light aspiration and support, the vault with its graceful forms appearing to lightly rest on the columns. This treatment was especially peculiar to large antique columns with groined vaults (Fig. 231). Spaces between the piers are joined to the principal room and large semicircular windows may be placed in the wall above them and beneath the arch, through which room is lighted in the most satisfactory way. These spaces are frequently separated from the central room by small colonnades.

The groin vault is especially suitable for arcades open along one side. In Roman Renaissance architecture, piers relieved on their external sides engaged columns with an entablature above them. Thus the heavy form of the pier was subdivided, and received a character of aspiration and support; the engag-

ed columns further to serve to strengthen the abutments, for the piers require considerable depth to resist the thrust, with but moderate width. The greatest lightness of construction results, if in vaulted porticoes groined vaults rest on columns instead of piers; yet the imposts must be tied by iron rods.

174. Pendentive Vaults.

Pendentive vaults are closely allied to groin vaults by their uses, and consist of a spherical surface described with half diagonal of square to be vaulted as radius. Semicircles on the four sides limit the surface of the vault; a horizontal circle at the crowns of these arches divides it into a central plain calotte and four pendentives. These surfaces are much better suited to a uniform system of decoration, than are those of the groin vault of four compartments, and the former is therefore preferred to the latter in modern architecture. In statical condition, the pendentive vault is similar to the groin vault, but the side arches receive part of the thrust, and should therefore not be too narrow in open vaulted porticoes. These arches have plain panels in their soffits, and their slightly projecting sides are bordered by cymas. The calotte is only separated from the pendentives (Fig. 232) by a belt of slight projection, since at this band the surface of the vault is inclined at 45 degrees. Suitable modes of decorating the calotte by coffers, by division into four large panels with figures, between them being narrow bands with a decorated circular space at the crown (Fig. 233), or by representing a tent roof with its decorations. Pendentives contain soaring figures, garlands, medallions, or ornaments rising from the imposts. All belts and enclosures are light in their general tone, decorative panels being colored.

If the Romans preferred the groin vault for covering large rooms, it may be because it was better adapted to construction in concrete with separate cross arches, than would be a vault with spherical surfaces. For vaults entirely of brickwork, the pendentive vault presents less difficulty and has greater strength at crown than the groined vault, which is very flat there. Subdivision of rectangular rooms into separate squares and covering these by pendentive vaults produces a plan of room similar to that of Roman halls with groin vaults (Figs. 234, 234a, 234b) Vaults may likewise be apparently supported by columns set before the piers, whose entablature forms the pier cap. Lighting may be either by large windows at sides and in walls beneath the arches, or by skylights in vaults. Spaces or chapels between the piers are covered by tunnel vaults, and are suited to receive galleries above small colonnades, which materially heighten the effect of the colossal columns supporting the vaults and of their massive entablature. This produces great variety and effective gradation of architectural forms and of enclosing surfaces, very ap-

propriate for decorative treatment. Yet with all its richness, a clear architectural subdivision predominates, and this mode of treating an interior produces an imposing and rich, and harmonious impression.

175. Domes.

The perimeter of the dome rests on a vertical cylindrical wall, exerting on this a uniform pressure and thrust; this cylindrical wall requires a treatment like that of walls supporting a tunnel vault. The wall may be penetrated by openings, or it may be concentrated in supporting piers connected by arches below the springing. The deep niches or chapels of the Pantheon in Rome (Fig. 235), apparently divide the wall into eight great piers, which externally contain hollow semicircular spaces. The vertical cylindrical wall is separated from the dome by a bold entablature, which should nearly correspond to that of a colonnade of equal height. As decorations for the dome, coffers of approximately square shape are appropriate, since the vertical and horizontal ribs clearly emphasize the form of the hemisphere. In the best examples, the number of coffers in one row is 24 to 26, with 5 or 3 in height. Above the coffers, a deep ring surrounds the sky-light, bordered by a delicate moulding next the latter. The opening for light has a delicate cornice at top, and its vertical surface is treated as a frieze-like band. Its lower edge may have a round moulding ornamented by leaves.

The division into coffers is independent of subdivision of wall beneath. But the vault may instead be decorated by large panels alternating with narrowbands or small coffers. Eight broad spaces are usually separated by intervening narrow panels or bands, being enclosed by ^{these} above and below, and small square coffers are then placed at the angles. As in the treatment of the tunnel vault, the relief is kept low and the bands or ribs project only so far that cymas may be formed beside them. The large panels may then be enclosed by delicate mouldings, receiving figures in low relief or paintings. This treatment appears especially appropriate, when the dome covers a polygon and not a circle. Such antique interiors show effective treatment of the wall; a gallery is arranged in the wall above the great lower niches and opens into the room by an arch above each niche, supported by small columns. The circular closed form of wall, the vaulting recalling the sky, the light from above, illuminating all objects in an unusual and very effective manner, all impart to a domed interior a solemn and earnest effect, making it especially suited for sculptures in relief.

176. Groin Vaults enclosing Panels.

All forms of vaults heretofore considered are based on the semicircle. But in residences and palaces, heights of larger apartments are seldom sufficient to be covered by previous forms of vaults. These are rather used on a large

scale in monumental public buildings, churches, museums, libraries, etc. Where used in residences, this is on a small scale in vestibules, loggias, corridors, etc. But to give ceilings in palaces a monumental decoration and make them suitable to receive costly ornamentation and paintings, the Renaissance invented vaults, which required less rise for large spaces, thereby approximating to plane ceilings. These consist of various forms of groin or coved vault with horizontal central panel (Figs. 236, 237). This form of vault rises steeply from the wall and towards the centre passes into a larger slightly curved or plane surface. Such vaults are seldom built with reference to the forces acting in them and their durability chiefly depends on good mortar. A true vault of this kind over a rectangular room has the central surface supported by half tunnel vaults (cove ceiling, Fig. 238). Reducing the central surface, this form passes into the cloister vault. The best proportions for decorative treatment result, when the central space with its enclosing cornices has about half the dimensions of the rectangle enclosed by springing lines. The half tunnel vault is then suitable to receive large pictures, extending from lower to upper border, conveniently placed for the eye. These painted surfaces may be limited at angles by extending the bands enclosing the central space. These triangles may be filled with arabesques, perhaps with a middle panel. The central space is enclosed by a delicate cornice of slight projection with a broad band. To not require masses of stucco-work, the section of this band should be kept close to surface of the vault. The subject of this central panel should contrast with the lower figures, and be decorative in its nature, consisting of rosettes, arabesques, garlands, shields of arms, etc. Beautiful examples of such Renaissance decorations are found in the middle loggia corridor in the Vatican containing Raphael's Biblical pictures, (where this vault is used above semicircular arches to cover the separate bays of a long corridor), as well as in the salons in Massimi Palace and in Villa Lanti at Rome.

The most extended use during the Renaissance was made of that form of this vault with the cove intersected by a series of compartments, thus forming a half groined vault (Figs. 239, 240). The middle surface consists of panels of two kinds, alternating in shape and location and very suitable for decoration; windows extend to crowns of side compartments and thus completely light the room. Instead of a complete vault, the central space is frequently enclosed by a wooden frame, against which it abut the marginal vaults, and it is then treated as a coffered ceiling or is filled by a large picture, composed to suit its location. On the edges of the outer compartments and on the ribs of the groined vaults are leaf mouldings or rounds, carried horizontally around the border of the middle space. Within this is an enclosing member,

which projects little in a complete vault, but with inserted frame and raised panel may have the complete profile of an entablature. In the decoration, the different surfaces have a varied treatment in color and ornament. If ends of side compartments are closed, these surfaces and the central space are suitable for picturesque compositions. In contrast with these, the compartments and the triangles or pendentives receive a predominating ornamental decoration with ground tones of different colors. Many Renaissance decorations have in the pendentives shrines with figures, supported and accompanied by ornamental forms (Fig. 241). These surfaces may also be divided into a hexagon and three small triangles, the first being appropriate to receive a figure. Such a decoration was employed in the portico of Villa Farnesina in Rome by Raphael. Painted garlands of leaves and flowers cover angles of the compartments and enclose the central surface. Panels have blue grounds and are treated like the sky, on them being represented the story of Psyche with figures soaring as if resting on clouds. The whole exhibits Raphael's sense of beauty and produces an enchanting effect, which could only be produced in similar decorations by a master with genius.

c. Connection of Apartments.

177. Rooms arranged in Suites.

Simple forms of rooms may in many ways be combined to form suites of apartments. They may be either directly joined, appearing as portions of an apartment, or be merely arranged in a series along main axes and connected by doorways, forming the separate divisions of a building. Thorough treatment of connection of rooms is not intended, but it will be briefly illustrated by some examples. The arrangement of rooms as first mentioned first appeared in many Renaissance basilicas, where with horizontal ceiling of central aisle, side aisles were covered by groined vaults or pendentive domes.

The heavy loading of arcades by clearstory walls so nearly neutralizes the thrusts of the vaults, that their resultant is but slightly inclined. The necessary buttresses are included within the building to form recesses for chapels. The side aisles thereby has a rich and architecturally beautiful treatment, with an effective contrast to the spacious middle aisle. As in Early Christian models, the choir usually ends in semicircular form and is covered by a half dome. Beautiful examples are found in basilicas by Brunelleschi in Florence (with rectangular apse) and San Bartolomeo in Bologna (with ceiling lights in pendentive domes of side aisles).

It was most common to combine various forms of vaults in subdivided plans of rooms, using horizontal ceilings and vaults over different parts. A combination of groin and tunnel vaults was mentioned in the description of Roman halls. Pendentive or depressed domes form harmonious combinations with all

semicircular type of vaults. With a skylight and covering the central part of the room, supported by four strong piers, they produce with adjacent vaults a strongly united form of room. Thus the Braccio Nuovo of Vatican Museum with two tunnel vaults and half dome, the whole being lighted by skylights. In vestibule of Villa Madama, Figs. 242, 243, the central pendentive dome is flanked by two groin vaults and extended in depth by a tunnel vault; each room with groin vault is extended on two sides by large niches.

178. Connection of Room with Central Building.

If the central space be increased in height by placing a dome over it, and if on four sides lower tunnel vaults or half domes adjoin it, this produces the grand and beautiful combination especially developed in Renaissance churches and known as a centralized building. The central space consists of two forms placed one above the other; the lower part is square, with four piers connected by semicircular angles arches and supporting pendentives, which form at top a horizontal circle and are crowned by a bold terminal cornice. Surfaces of these vaults are portions of a spherical surface, when piers stand at angles of a square. But if the piers are partially moved into the square and its angles are cut off by straight lines, the pendentive vaults form peculiarly curved surfaces, which horizontally gradually pass from right lines into a circle. These surfaces overhang the less, the more nearly the plan of the room approximates an octagon. This is much better suited to support a heavy and large superstructure, than are regular pendentives over a square. Above the circular cornice of the pendentives rises a vertical drum and a dome resting on it. The drum must relieve the thrust of the dome and therefore usually has projections on its exterior to make the interior of the dome appear light, and to admit light freely. If the pendentives are placed over a square, this dome cannot exert a great vertical pressure on them, and should have but a moderate height. Both the form of vault and the scale of execution are decisive, for construction may be executed securely in small dimensions, but the resistance of the materials does not increase with its dimensions, but the resistance of the materials does not increase with its dimensions. It may generally be taken as a rule, that the higher the drum and dome are made, the more closely the plan of the pendentives should approximate to an octagon, when its heights are similar (Fig. 244). This produces proportions harmonizing with the construction and pleasing to the eye; diminishing the main sides of the lower part, arched openings become more slender and a corresponding form then results structurally in the superstructure. But with the square, arched openings are usually wide and require structurally and esthetically only a slight increase in height of the dome.

The following principles are applicable to architectural forms of the prae-

central space. Pilasters or columns are set in front of the four main piers and their entablature forms the impost cornices for main arches. This causes the construction to lose the impression of heavy massiveness, and it acquires a character of aspiration and support. The surface of each pier next the central space should have a niche with tablet or relief above it. In each pendentive surface a large circular space should be enclosed by a bold moulding, filled by a figure, the remaining angles receive ornamental decoration. The upper limiting edge of this vault has a bold half round, above which is a vertical frieze, and the pendentives then end with a strongly projecting cornice of larger dimensions than the impost cornice. The vertical frieze prepares for the vertical surfaces above, so that by contrast of the strong cornice with the refined forms of the dome, its dimensions are apparently increased, and the base of the drum, whose simple form rests rather heavily upon the pendentives, is concealed from below. Above the plain base the drum has a series of pilasters whose height is two-thirds to one-half that of lower order. The intervals are arranged on the lower axes, contain windows with simple architraves, and are from eight to sixteen in number, according to height of dome and size of building. The dome is always subdivided to suit the arrangement of the pilasters, so that large spaces are above windows. In contrast to the lower architecture, the drum and dome should have a character of gracefulness lightness, assisted by colored decoration, the lower part having relief ornament to suit its bolder architecture. But pendentives are usually decorated by painting.

Rooms adjoining the central space have tunnel vaults and compose a cross form, in whose angles are usually placed smaller domed spaces connected with the side rooms by large arches (Connection with central space would weaken the piers or diminish width of arches across arms of cross). Decorative treatment of arms of cross follows that of central space. The order of pilasters extends in them and the tunnel vaults have coffers. The severe and heavy effect of coffers by contrast makes the decoration of dome appear lighter and more elegant. Instead of cross arms with tunnel vaults, semicircular apses covered by half domes and with gallery passages may adjoin the central space. The great pilasters in the central space must be omitted, or they must be made so slender and purely ornamental, that connection of architecture of central space with that of adjacent half domes is made possible. The centralized building, though having an ecclesiastical origin, is frequently used in secular architecture, if treated in accordance with a noble and ideal solution of the programme. "The whole should be essentially a building of purely esthetic aspiration for the architectural forms in themselves, just as well suited for every other ideal purpose as for divine service".

179. Heightening the Effect.

The different rooms in an architectural design may, as stated in Divisions 1 and 3, be divided into vestibules, communications, and principal apartments, according to their purposes. According to the importance of the rooms, a suitable gradation should appear in their decoration. In the order in which we pass through them to the principal apartment, there should be a transition from severe architecture of the exterior to elegant colored ornamentation. Therefore the vestibule and the entrance hall retain the character of the external architecture, and we economise decorative forms there, to heighten the effect in succeeding rooms by greater richness. Vestibules should be less strongly lighted than the principal apartment, to produce a gradual increase in lighting. The effect of rooms uniformly lighted by light from high above is materially increased if we enter through a darker vestibule. The highest effect in decoration and the most harmonious lighting is required in the chief apartments of the building. These should express in monumental designs the intellectual significance of the building, where the form of room, its decoration sculpture, and painting work together in a harmonious way.

DIVISION V.

VESTIBULES? STAIRWAYS, COURTS, AND HALLS.

By Professor Heinrich Wagner.

180. General.

Since the general designing of a building in plan, and section has been considered in the last Division, this last Division of Architectural Composition may then dismiss the arrangement of the building further, so far as it concerns rooms for common use, more or less developed in nearly every building, such as vestibules, stairways and courts. Designs for halls so commonly occur as entirely independent, or as portions of other buildings, that they are here subjected to general study.

The importance of stairways, vestibules, and courts, and their location and arrangement were discussed in Division 3 (Arts. 114, 128); their architectural treatment, with that of halls, was treated in the last Division. We now have to investigate their plans in general, their relations to each other, and to the principal parts of the building. From the intimate relation of these portions of the building, especially of the vestibules, stairways and courts, they cannot be separated, but are rather to be considered as a whole.

Chapter 1. Vestibules and Doorways, Entrance Halls and Corridors.

181. Diversity in Plan.

According to whether a building is to serve for public or private purposes, the plan of its ante rooms, vestibules, entrances, doorways, entrance

halls, and corridors, will have to be treated in different ways. These are the connecting rooms in the building, and their function is to facilitate passage from its exterior to its interior. This is true of both architectural treatment (Art. 179) and convenience of passage. They should harmoniously unite differences in form caused by external and internal influences, just as they lead from the hurry of the exterior to the life of the interior. This assumes that entrance rooms of a private house should be much smaller than those of a public building, whose interior is always intended for the use of the external world. And since every prominent peculiarity should be reflected in the architecture, this would assume a more purely interior character in entrance rooms of a private house, than in those of a public building. Especially in the corridors, which are the vestibules to each story, but less so in vestibule and entrance hall to the interior of the building; least of all in buildings for large halls, the corridors partly forming an extension of the building outward, partly a passage or corridor around it,

In such designs climate plays an important part, and the treatment must be arranged to suit it. Entrance rooms in northern countries must afford protection from rain, snow, and cold, and they must also be partially warmed, while in the warm countries free access of air and protection from scorching sun are required. Halls and vestibules may be treated with more beautiful and dignified effect, whose climate is mild and pleasant. Entrance rooms may then be more freely open, appearing better and more clearly on the exterior of the building. Their plans are to be considered in connection with the location of the entrance, on which the arrangement of all entrance rooms depends.

a. Plans of Halls.

182. Porticoes, Arcades, Colonnades, etc.

Entrances to buildings frequently form imposing rooms opening externally, like porticoes of ancient temples, which project from the structural organism itself, and are both simple and noble models of one story designs. In Figs. 245 to 247, the portico is brought under the same roof with the temple cell, sometimes at only one end, sometimes at both, also frequently extends along the sides. In Fig. 245 it has the character of an enclosure, but in Figs. 246 and 247 it is an open portico. It is an esthetic requirement that such porticoes should not be set directly on the earth, but should be raised and commence on a substructure; they would otherwise have the effect of growing out of the ground and would not appear like free artistic creations; their general design would lose much in independent effect.

Due importance was assigned to porticoes in the architecture of all periods; in scarcely a public building in antiquity, were they wanting. They were either covered by a horizontal ceiling or by vaults. Openings were either rect-

angular or arched, subdivided by piers or columns. These open porticoes (colonnades or arcades) are not merely in a single story, but also occur in several stories, according to whether, as in large Grecian temples, the external order occupies the entire height of the structure, only in the interior being two orders above each other, or whether the subdivision into stories extends to the exterior.

Excellent examples of the former are portico of Schinkel's Museum in Berlin (Figs. 91, 249), Klenze's Glyptothek in Munich (Fig. 248), Semper's Capitol in Winterthur (Fig. 203), and Hansen's Academy of Sciences in Athens (Fig. 252). Typical buildings of the latter kind, among other elegant creations of the Renaissance are Belvedere at Prague (Fig. 250) and Basilica at Vicenza (Fig. 251). The former was built by Paola della Stella after 1536 and is surrounded by porticoes; the latter has two stories of porticoes, Andrea Palladio having rebuilt the old Palazzo della Ragione as a "Basilica". The simple grandeur of the first strikes the eye; in the latter, the exterior consists of arcades, but has the genuine character of the portico, although dominated by the inner nucleus of the building in the most effective manner. Arcades or colonnades appear as projections or porticoes, and very frequently as loggias and recesses with closed ends. In all cases the porticoes serve to freely open externally the walls of the facade, sometimes in the lower story (Fig. 198), sometimes in the upper one (Fig. 206), also occasionally in several stories.

183. Street Porticoes and Verandas.

We find on many buildings, especially in southern countries, external porticos extending along the lower story, covered and forming open passages protected from sunshine, and suited for work and life in the open air, so dear to southern races. They also frequently occur in the German Renaissance. Streets occupied on both sides by high buildings, especially whose lower stories have porticoes or verandas, generally produce a heavy and unpleasant impression. Projecting structures of every kind, especially porticoes, are obnoxious to governments sometimes compelled to fight in the streets, or to march soldiers through them although such structures must have been common in many cities, where no longer found. For political reasons Rome and Naples have no street porticoes.

With these useful and often very picturesque designs, the principal entrance to the building is with difficulty recognized; the portico no longer invites entrance into the building; it even partially obstructs light to the rooms behind it. It is therefore customary to make them as light as possible, when such porticoes are built, (as for example at hotel "Frankfurter Hof" at Frankfurt-A-M., Fig. 253, and the new arcades adjoining the City Hall at Vien-

na, Figs. 254, 255). From the faults mentioned, such porticos have fallen into disuse in northern Europe. At the beginning of this century and even a few centuries since, they were frequently employed, as in Rue de Rivoli and other streets in Paris (Fig. 254), likewise in Karlsruhe, etc. With few exceptions (as the examples in Figs. 253, 254), they have been almost entirely replaced by modern street porticos and shops with large show windows.

184. Connecting Porticos and Promenades.

If porticos are only intended to form covered promenades and resting places without enclosed rooms beside or above them, these creations belong to a class claiming especial importance. They usually also serve as an elegant and architecturally effective connection between several buildings or parts of buildings (Figs. 253, 257), or to extend them externally. The courts of Egyptian temples were thus surrounded by porticos, as well as most public squares of the ancient Greeks and Romans, these being connected with public buildings as well as with private houses. The porticos of Pompey and Octavia in Rome were favorite promenades of wealthy youths. Those of the Forums, Baths, Gymnasiums, etc., likewise played a great part in daily life.

An example in the Italian High Renaissance is the noble portico by Bernini (Fig. 256), which encloses the Place before St. Peter's Church in Rome. The front portion is an elliptical enclosure with four rows of columns about an uncovered area, at its centre being the obelisk with fountains at each side. The rear portion is enclosed by simple straight porticos diverging towards the church to make the smaller place appear larger and deeper. A similar design, consisting of porticos of quadrant plan, was erected before Kazan Cathedral in St. Petersburg, and Alexander I had it built by Varonikin in memory of the victories of 1812-15.

The same motive forms the basis of several examples produced in recent years, such as the porticos of the magnificent Palace of Longchamp near Marseilles (by Esperandieu, 1862-70), and those of the Palace of Trocadero in Paris (by Davioud and Bourdais, 1878). The colonnades of the former (Fig. 257) merely serve as promenades connecting the angle buildings with the central building, while those of Trocadero Palace are also utilized for exhibitions, and are enclosed at the rear by a wall.

185. State Porticos and Loggias.

To these architectural designs are to be added state porticos, which do not serve as promenades, but are chiefly devoted to public uses. Here belong detached open loggias which especially occur in Italy, and which are to be considered as independent buildings. One of the finest examples of this kind is Loggia dei Lanzi in Florence (by Orcagna, 1375). The three great arches with an arch at each side, in the facade of the loggia are of imposing dimen-

sions (Table, Art. 100), but are so elegantly treated and so intimately connected with the cornice, that the building is unsurpassed in this respect. Other porticos enclose tombs and courts of monumental cemeteries, also cloister courts, etc. Further discussion will be left to Chapter 3 (Plans of Courts) and later volumes.

186. Treatment of Porticos.

In the treatment of porticos, especially of vaulted arcades, it is essential to devote the necessary attention to the endings at their angles, and it is usually advisable for structural and esthetic reasons to strengthen the supports there. This is generally done by placing columns, pilasters, or piers before the members supporting the arches. If porticos are arranged in several stories, care is usually taken to treat the lower story in forms suggesting greater strength, passing upwards into lighter forms. We may begin with the Doric or Tuscan Order; the Ionic will follow, then the Corinthian, perhaps caryatids or Hermes-like piers. The latter will have a good effect only when at a moderate height, for when higher from the ground, their detail forms will not be visible, and the artistic value of the figures will not have its full effect. For formal treatment of porticos, we refer to Part I, Vol. 3 of this Handbuch.

187. Galleries, Corridors, etc.

The use of externally open porticos and loggias is naturally limited in our climate (Germany). They are so much exposed to wind and weather, that when intended for connecting apartments, they do not accord with our views and customs. Yet the portico is such an effective element of architectural composition, that it must be regarded as indispensable. A simple means of employing them without these injurious effects, consists in treating the openings as windows and glazing them, otherwise retaining construction and treatment of the portico in all essential parts. This is now common, especially in new buildings. Even the famous Loggias of Raphael in the Vatican in Rome were enclosed, and their imitations, the loggias of the Old Pinacothek in Munich. These cannot produce the strong effect of shadow found in the open porticos. Their place was taken by glazed galleries and corridors, which otherwise exhibit the same monumental character. This is illustrated by Fig. 258, from Palace of Justice in Paris (by Duc and Daumet).

b. Entrances and Doorways.

188. The Entrance.

The entrances are parts interposed between exterior and interior of the building. Entrances to buildings have been artistically treated from ancient times. The more conspicuously the mass of the building is treated, which separates the public square or street from the interior of the building, the great-

er is the need of emphasizing the connecting entrance. It should always be so treated that access through it to the entire interior of the building is evident, and one is not required to seek another entrance. Independent gateways are detached from the building or loosely connected with it, usually when the structure stands in the middle of grounds, or is built back from the street or road then requiring an enclosure, entered through the gateway. (Fig. 259).

189. Location.

The location of the entrance is of very particular importance; this was mentioned in Division III (Art. 126) as one of the chief points in arranging the system of passages in the building. As for the appearance of the building the portal usually is an artistic accenting of the principal axis of the structure. The entrance to the building should be recognizable at the first glance, and the axes of the principle facade, or those of the different prominent masses of the structure, are the places where they are sought and should be found.

It is not always possible to place the entrance at the centre of the facade. This occurs when all rooms in the front of the building must form a connected series, or when the length of the front is so small that a division in two halves would be unsuitable for rooms to be arranged at each side. The entrance is then placed left or right of the centre, frequently at one end of the facade, or often being even in one side of the building. The latter is permissible in short facades, especially in freely grouped structures, if the doorway is readily seen from the front. But the rear of the building is never suitable for the main entrance, only for entrance for purveyors, servants and private persons. In buildings at the corner of the street, it is usually best to arrange the entrance at the corner, especially when much used. (Art. 212; Fig. 305). If the structure surrounds a court, it is advisable to so arrange the entrance that one may directly pass from it into the court. This entrance will then be like a portico and is usually intended to be a carriage entrance.

190. Separate Entrances.

A single doorway is seldom sufficient for large buildings; several entrances are frequently necessary to lead to different parts of the structure, since they serve for varied purposes. With sufficient length of facade, they may then be symmetrically arranged on one facade, so far as they have nearly equal dignity. But it is frequently hard to adopt the latter arrangement to the requirement of recognition of the main portal, and with due regard to internal subdivision of the building. When several entrances are necessary, they are usually placed in different sides, if these are accessible.

Distribution of doorways to the principal and side facades, or the greatest possible division and separation of the several entrances is indispensable,

if separation of persons entering the building is for good reasons advisable or necessary. This is the case with all designs, where great numbers of persons are to be admitted in brief time to the interior, or are to find exit therefrom.

First is a separation of entrances for carriages from those for persons on foot, which is possible in various ways, especially by arranging the portal on the main axis for persons, placing the carriage entrance at one side, or the converse. Instructive examples are shown by plans of theatres, halls, concert halls, etc. (Figs. 178, 275, 312). This separation is more difficult on a single facade, if other buildings closely adjoin both sides. Yet the entrance for persons may be placed beside the carriage entrance and combined with that into a single entrance portico (Figs. 261, 254); in simple buildings, a single doorway is usually provided for both purposes.

191. The Portal.

The portal distinguishes the entrance and as an attractive and rich enclosure of the doorway should appear as a prominent part of the building. The general form and decoration of the portal have been treated with especial liking by architects in all the best architectural periods. In no other portion of the building may be found such abundance of the most elegant creations. The architecture of the modern period has sought its models in the extremely varied and peculiar forms of Renaissance portals. Some examples are shown in Figs. 194, 202, 203, 204.

192. Forms.

In regard to dimensions and forms of entrance doorways, in order to make them easily recognizable, they must be distinguished, both by prominent size in proportion to other parts of the building and by richer ornamentation, but must also appear as belonging to the entire building and intimately connected with it. The architectural treatment of the doorway may partially express the purpose of the structure. If an entrance is heavy, wide, and low, it has the effect as if the building is intended to keep fast or hold of persons as well as of things, like prisons, arsenals, etc. But if the entrance be light and lofty in proportion to its width, apartments may be expected within for magnificence and festal enjoyment.

A very characteristic form of free opening toward the exterior is common in portals of mediaeval churches and cathedrals, consisting in an arched treatment of the opening enlarged externally. No less characteristic and equally inviting is the arrangement of an outer gateway, whose plan is usually a half ellipse or oval, and which makes a kind of niche-like vestibule as a portal. Strongly covered members and recesses of many doorways and gateways result from the same esthetic feeling. Such views harmonize with another mo-

tive, revived into fashion very recently, for accenting doorways and porticos of monumental buildings. It consists in the Roman triumphal arch. It was used by Semper and others with more or less success on theatres, exhibition palaces, parliament houses, and other state buildings, whose size and importance are to be made prominent.

193. Entrance Porticos.

The entrance frequently leads through a covered portico, sometimes open and sometimes closed, either placed entirely before the facade, as in Figs. 248 to 250, or as in Figs. 260, 261 arranged entirely within the building between adjacent apartments. In both cases it is generally necessary to set the building back from the building line of the square or street as much as the depth of the projecting portion. Entrance porches are sometimes found in Gothic churches, with a plan in form of a triangle or pentagon, one side containing the entrance doorway, the two others being treated as openings for passage (Fig. 262). Porticos may serve as entrances or gateways for carriages; they then receive different names according to their arrangement and have the advantage that one may enter the building with clean shoes. Covered carriage porches are preferable to carriage passages, which are easily exposed to draughts of air.

194. Carriage Porches.

Placing the entrance beneath a covered carriage porch is preferable in palaces and large public buildings. Floors of such porches must not be elevated. Ramps are arranged at each side, and must not be too steep, being the longer, the higher the carriage porch is raised. Fig. 264 shows an uncovered drive, and the ground story plan in Fig. 178 shows two with projecting roofs; Fig. 263 is a carriage porch with curved ramps, Fig. 266 is one with straight ramps, and Fig. 265 is a carriage porch at an angle. Besides the ramps of the carriage porch, it is customary to arrange steps before it on the exterior, (Figs. 263, 266), and these afford a welcome motive for architectural treatment.

Carriage porches are to be harmonized with the exterior of the building, and are therefore to be built of the same material and with the same treatment of forms as the latter. If the carriage porch be only a protecting roof supported by light iron columns, it merely appears as an accessory of the building, or like a foreign element attached to it. The esthetic impression of such treatment is seldom entirely pleasing. The effect of the entrance itself is thereby injured.

195. Carriage Passages.

Carriage passages or drives, and gateways, termed gateway porticos if sufficiently spacious, are enclosed by simple subdivided walls, or developed like a portico with colonnades or arches. If they are also used by persons on foot,

these are protected by a corresponding separation, either by a raised walk or by a colonnade (Fig. 237).

The carriage entrance is also generally an exit, so that carriages must turn around in the court of the building. If a large number of carriages is to be expected in both directions and at the same time or if it is impossible for carriages to turn in the interior, separate carriage entrances and exits are advisable. These may be on different sides or on the same side of the building, and will preferably be so arranged, if the building site directly adjoins the street at the sides or rear (Plan in Fig. 185), or when the plan permits both to be connected together by a double entrance portico, or a carriage passage is provided at separate and suitable points of the main facade of the building (Fig. 238, 307).

c. Vestibules and Entrance Halls.

196. The Vestibule.

The passage from entrance portico to interior of the building is formed by the vestibule or entrance hall. By vestibule is not to be understood only the ante-room next the entrance, separated by this from external connection with the street, court, or garden, but it also signifies the hall, which forms a passage to the different rooms on the same level and also frequently contains the entrance to the staircase leading to the upper stories (Fig. 239).

In Italian palaces of the late Renaissance, the vestibule was much increased in size to accommodate numerous servants in attendance on visitors. The gateway was then treated as a carriage entrance and was made large and wide. Vestibules in Florence by Bramante were seldom more than a passage with tunnel vault, but became a larger and higher vaulted room. The vestibule became one of the highest problems, for the staircase (next Chap.) had before been merely dignified and convenient, was then presented to the eye and to the imagination as an element of beauty, and was directly included in the vestibule. The entrance hall became of equal importance with similar halls in northern and southern Germany. In the upper stories, this forms an ante-room like the hall on the ground floor, a corridor or passage to the rooms.

197. The Entrance Hall.

This ante room for passage will then be termed the entrance hall or vestibule, when especially spacious or remarkable, being usually designed somewhat like a portico, and frequently decorated by sculptured and painted ornamentation. As the first rooms entered by a visitor, the vestibule and entrance hall decide the impression made by the interior. If the building contains several apartments, the entrance hall must not be prominent for especial magnificence in decoration; it must not excel the apartments in this way, and must not delay the visitor on its own account, but rather by quiet and noble forms

of stone architecture and by similarity to the external architecture prepare him for the increased effect presented by the internal decoration of the apartments.

198. Treatment.

The entrance hall is that room through which passage is opened to the principal portions of the interior (Fig. 270), but it is not usually a room for attendants, only for passage, with a separate room for the porter added to the side. Being not intended for a continuous occupancy, the vestibule or entrance hall should be less lighted than the other rooms, where good lighting is a chief requisite; in palaces, it usually receives indirect light only, since its central location and the carriage porch and other arrangements before the main entrance prevents direct lighting. The vestibule should be so arranged, that if not square, its larger axis may have the direction of the depth of the building, its smaller axis being that of the facade or parallel to the front (Figs. 271, 272). It is frequently necessary to keep the part next the entrance on the same level as the portico or threshold of the entrance, then ascending by steps to those parts of the entrance hall at a higher level. (Figs. 271, 272).

By the rooms placed over the reception hall and the requirements for supporting them, one must be guided in the treatment of the entrance hall; it therefore frequently has columns, piers, etc., to support the ceiling, and these are to be arranged regularly on both sides of the principal axis. With two rows of columns, a central wider passage and two narrower side passages may be arranged (Figs. 272, 281). But the entrance hall appears more dignified if without dividing columns. The use of columns partially depends on the height which may be given to the entrance hall. If they are not to appear stumpy, for relatively small height free columns are advisable, to produce a good effect by dividing the available space into several narrower spaces.

In palatial buildings in southern Europe as frequently in Italy, the entrance hall occupies at least one and one-half stories, a mezzanine story being usually placed above the ground story, above which is the floor of the principal story; vaulting the rooms is customary in southern Europe and requires so much height that the entrance hall cannot be made low. It is always desirable for the entrance hall to have a respectable height, and therefore it frequently extends through two full stories. An entrance corridor is sometimes arranged in an upper story also, especially in the principal story, as in Fig. 274.

199. Peculiarities.

In many buildings entrance halls receive a peculiar treatment, required partly by local conditions (Fig. 105) partly by the special purposes they are to fulfil. Without going into details of plans, a few typical examples are illustrated. An important part is played by entrance halls in theatres and oth-

er buildings, intended to receive great numbers of persons. It is advisable, especially in northern Europe, to place wind screens at entrance doors leading to entrance halls. In entrance halls of theatres several entrance doors are arranged (opening outwards). If external walls are sufficiently thick to have sufficient space between doors placed at outside and inside of wall, the use of wind screens will be avoided; it is advisable to avoid an internal projection of wind screens by adding a separate thin wall in the entrance hall to form a vestibule, only beyond this wall treating the entrance hall as a united room. (Compare Figs. 275 and 178).

For churches it is appropriate to pass from exterior to interior through an enclosed vestibule, to protect the interior of the church from draughts, also providing an ante-room, where persons may form in processions before entering the church. A prominent part in modern architecture is played by waiting rooms of great railway stations. From their peculiar requirements and account of the enormous traffic, they sometimes have colossal dimensions and a peculiar development.

In English country houses, the entrance hall is generally an entirely closed apartment or noble hall that can be warmed, and in accordance with ancient traditions, it forms an indispensable part of the family residence, being accordingly decorated by paintings, arms, hunting trophies, etc., though frequently treated in a more simple and common manner (Fig. 276). A quite different character appears in the vestibule of French private residences. Just as notably treated in its way as the English entrance hall, it does not produce the same impression of cosiness and comfort, but by its formal treatment always is a pleasing transition from the external architecture to the internal decoration (Fig. 277).

200. Waiting Corridors.

With vestibules and entrance halls belong waiting corridors, which are in France common in Court Houses, etc., the so-called Salles de pas perdus. These are long corridors to which the public is restricted, sometimes transacting necessary business with officials, sometimes awaiting an order to enter the court room. These rooms are high, airy, and are treated with massive richness, always with a severe character. (Figs. 278, 279). Many halls in other kinds of buildings possess a similar character (see Figs. 280, 317a).

Chapter 2. Plans of Stairways.

201. General.

"Very careful attention is required to designing stairways; for difficulties are great, to be overcome in giving them a suitable location, and one not injurious to the rest of the building. Praiseworthy are staircases that are light, spacious, and easy, thereby inviting one to visit the building".

In nearly these words in Chapter 28, Book 1 of his "Architecture, Palladio points out the chief requirements for these important connecting members of the structural organism. Very much depends on correct arrangement of the staircases. Yet this will be materially simplified by that said in the last Division in reference to planning the building in general, and that in Part III of this Handbuch on their arrangement and construction, parts in detail, and on external staircases. There remains the designing of staircases in the interior of the building, especially those of monumental character.

a. Forms of Staircases.

202. Historical.

To characterize staircases of different periods of art, the following points become prominent. In antiquity, staircases in the interior of the building could acquire no importance. Principal apartments were limited to the ground floor; stairways leading to upper stories were enclosed between walls, and appear to have received no architectural treatment, and were quite steep. This is assumed from the writings of Vitruvius (Book IX, Chap. II) and is proved by extensive and partially preserved staircases of Roman amphitheaters, planned with extraordinary skill, to provide access to all parts of the building for great multitudes of persons, with quick egress for them in the most perfect manner. Staircases of mediaeval buildings are generally placed on facades in open stairways or stair towers and mostly consist of winding steps. Desire for richer treatment appears everywhere under influences of late Gothic and Early Renaissance in numerous gracefully grouped and effective creations. The monumental stairways in interiors of buildings are among the creations of the Italian Renaissance, and they have been transferred to modern architecture without material change. Especially in public and palatial buildings, while dwellings have comfortable, and attractive staircases.

Stairs will be considered from the point of view of suitability, without reference to diversities in material, construction, and form.

1. Stairs in Straight Flights.

The steps of the staircase sometimes continue in one flight without interruption, but they are generally at proper intervals divided into separate flights by walking spaces or landings, with or without change in direction. The most varied forms result from influences affecting arrangement in the interior of the building, yet these may be classed under a number of simple types.

203. Straight Staircases.

The form most convenient and appropriate for ascent and descent is the straight staircase without turns from beginning to end. It may be enclosed between two walls extending beside the steps (Fig. 281) be built free on both sides in the

room (Fig. 282), or may be free on one side and built against a wall on the other (Fig. 283). In all cases, particularly if the height is very great, this requires a great length of space, and in the first case a considerable width as well, if the staircase must not appear very narrow in proportion to its length and height. If several staircases of this kind must be placed above each other, the maximum distance must be traveled in passing from floor to floor. But if not required to economize space, the straight staircase is grand and simple in general effect and is not excelled by any other. It is therefore particularly adopted to monumental buildings, either is single or double in plan, or may be arranged symmetrically to A B or C D (Figs. 281, 283).

One of the noblest structures of the first kind is the Scala Regia (Royal Stairs) (by Bernini) leading to pontifical apartments in Vatican at Rome (Fig. 284), which extends in a single flight for more than 197 ft. in length, and even appears much longer in perspective than is actually the case, for between the pair of columns its width at the lower end is 27.5 ft. this diminishes to 16.4 ft. at the upper end. A magnificent example of straight double staircase was in Hotel de Ville in Paris, destroyed in 1871. Fig. 311 represents on one half, the plan of the ground story, on the other being that of the principal story.

Especially in stories at upper ends of such staircases, they are furnished with galleries to connect them with the adjoining rooms, and these are either treated like porticos (Fig. 311), or are free above and are merely enclosed by balustrades next the staircase (Fig. 281). As a simple staircase before halls, in entrance halls, in courts, etc., the straight staircase, as in Fig. 282, is very frequently employed. (Fig. 280, etc.). This type is also used for ordinary stairs with moderate height of story, if arranged along a passage required for communication or in a generally accessible space.

204. Staircases in Several Flights.

The direction may generally be changed for each flight between landings, producing staircases in several flights. If this change always occurs in the same direction, a simple staircase results, if in both directions, we have the double staircase in two flights.

205. Staircases in Two Flights.

The staircase in two flights is formed when the upper flight forms on the plan an extension of, or a right, acute, or obtuse angle with the lower flight, the latter are rare. The staircase in Fig. 285 is divided in two flights at right angles, and its entire length appears at a glance, the lower flight appearing in front view and the upper in side view. Suitable treatment produces an interesting or even picturesque and effective view. These advantages make the staircase very appropriate, where as in Fig. 278, it is built free in the

room and forms a part of its decoration. That it is suited to even monumental buildings is shown by Fig. 285, also by plans of the Palace of Archduke Ludwig Victor in Vienna (Fig. 185), and by upper and lower entrance halls of Capitol at Winterthur, furnished with two such staircases (Fig. 310d).

By far most commonly used is the half space staircase, as in Fig. 286; for it is easily and compactly arranged with rooms of ordinary depth, is enclosed by itself, permits access from principal landing to the different rooms in that story, and at the same time ascent to the next story takes the shortest way. This is the most appropriate form, though not the most elegant in its appearance, since the upper flight of the stairs usually appears from beneath a dark mass; and as it cuts across the opening at midheight of the story, it partially obstructs the view in the stairway. This frequently occurs in Italian palaces (Fig. 272). Flights of stairs are there quite broad and are mostly enclosed between side walls, each flight appearing by itself as in straight staircases. As a principal staircase extending from one story to the next, it ends above in open form; external defects then disappear, and it is partly not visible on account of the enclosing walls and the ending of the upper part of the stairway, as shown by Fig. 286 (plan of ground story). It is often preferable to round off angles of the landing according to dotted lines in Figs. 286, 292.

206. Staircases in Three Flights.

Combining type forms in Figs. 285, 286 produces a staircase in three flights, as in Figs. 273, 287, a third short flight being added below or above to the half space stairs, usually at right angles to the middle string or wall, so as to begin or complete the ascent. This gives the lowest or second upper story greater height, without being compelled to require larger space for the stairway, with equal rises of steps. This form is likewise very frequent in Italian palaces. A good effect is also produced by three space staircase, which changes direction at right angles in Fig. 271, 288, especially if the second flight can have a greater length than the other two, producing a less obstructed view in the stairway (Fig. 277).

207. Staircases in Four Flights.

Likewise originated full space staircases, where as in Fig. 289, the flights from landing to landing turn at right angles, and end above the point of beginning. Staircases in Figs. 288, 289, are open towards the well-hole, and when several stories are arranged above each other, they receive light through skylight. They therefore possess special advantages for location in the interior of the building, and as shown by numerous examples and by the given plans, they are capable of effective architectural treatment. Both forms demand rather more floor space than many others on account of well-hole enclosed by front

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string, but they are otherwise easily arranged in plan, since they afford a suitable opportunity for varying ratio of length to breadth of stairway. But there is a minimum limit, fixed in accordance with Art. 220, which is that not less than three or four steps must be placed between landings.

208. Staircases in Two Branches or Doubled.

The most diverse forms of staircases are produced from the simple type forms by doubling them on the axes of entrance hall or vestibule, and which are given by lines A B and C D in Figs. 281, 283 and 285. These compound forms require no extended explanation, being readily derived from the preceding, and their use in interiors of buildings will be treated hereafter. The most useful staircase in two branches is that formed from Figs. 285, 286 and 288 by symmetrical arrangement about the axis A B of the middle flight, with which it begins, and which is divided to right and left. Repeated on the axis C D, it may be termed a double staircase. Examples are the staircase in Fig. 290, that in Fig. 240, and that in corner building in Fig. 305; also in Fig. 307, etc. In Fig. 305 the entrance to ground story is found on bisecting line of the angle, and therefore in this direction is the entrance to the staircase, but the exits in upper story are on both sides perpendicular to corridors parallel to street facades.

It may be said with regard to these staircases in two branches, that their effect is more spacious and stately than that of simple forms, but the demand for space is correspondingly greater. And when space is not abundant, a simple and spacious staircase is decidedly to be preferred to one of two branches, restricted in plan (see Art. 221). Burchhardt says that a chief innovation in the architecture of palaces in Late Renaissance consists in doubling staircases for sake of symmetry, after men had already become accustomed to such in gardens and courts after Bramante. They either commenced below with two separate staircases, or one staircase was divided in two above the first landing. Great merit is due to Genoa with its steep flights of steps, where care must always have been taken to obtain for the numerous external stairways a good and beautiful effect.

2. Winding Staircases.

209. Simple Forms.

Instead of changing the direction from landing to landing, as in the preceding straight typical forms, this may also be effected from step to step by winding staircases with a solid newel or a well-hole. These are either entirely of winders, as in Figs. 293, 294, or partially so, but usually are enclosed by a semicircle. Winding staircases are easily adapted to either a circular or polygonal, an oval or rectangular room, and is therefore more read-

ily employed on an irregular building site, than are stairs of other types (side stairs in palace, Figs. 185, 188). They occupy least space on plan, and admit of access at any height and at all points of the perimeter; they are also the only form suited to any stride, since on the radial steps may be selected at pleasure any proportion of tread to fixed rise, both ascending or descending.

This type has the defect in case of small radius, that the change in direction from step to step is perceptible, ascent and descent being quite troublesome, but this almost entirely disappears with a larger well-hole. On account of this difficulty the winding staircase is not employed where it is preferable for its other advantages, as when the arrangement of straight staircases is objectionable for local reasons (lack of space, irregularity, etc.). It was previously stated that winding staircases almost exclusively employed during the middle ages and the Early Renaissance.

As historical examples in Italian buildings, which seldom exhibit this typical form in the interior, are the circular staircase in Belvedere of Vatican (by Bramante, 1508), and the later oval staircase in Barberini Palace in Rome (by Borromini), only differing from the former by its elliptical plan (Fig. 294). Both are of considerable dimensions (about 29.5 ft. in clear width); the hollow newell is composed of twelve Doric columns, which follow the helical curvature of the strings and balustrade. Among designs of allied type, though of different form, are the elegant winding staircases in middle and southern Germany, mostly of the 18th century (Fig. 298); then among numerous French examples of Early Renaissance is the beautiful newell staircase of Chateau of Chateaudun, of beginning of 16th century, Figs. 295, 297. Differing from most contemporary designs, the latter is enclosed in the building, permitting free passage between A and B. The square plan is by conical vaults transformed into an octagon, and this into a circle by the eight corbelled out columns supporting the helical cornice.

Modern architecture has rightly changed to more simple forms of the staircases, at the same time with a practical limitation of their use. They are employed for minute uses in their most compact form as narrow isolated stairs with newells, but otherwise are only used for subordinate purposes, since they are entirely unsuitable for use by many persons. With a wide well-hole, they now occur as main staircases, usually in semicircular form, as in Fig. 291.

210. Compound Forms.

Winding stairs are suited to combine with straight ones. Most common is the type in Fig. 292, which may be placed in rooms ending in either rectangular, circular, or polygonal form, and which retains both the advantages and the de-

fects of the two forms composing it. It is appropriate where little space is available and an intermediate landing is omitted on account of low height of story, as in apartment houses and other buildings for purposes of utility. To insert a walking space in form of a sector of a circle instead of a few steps is more disturbing than advantageous, if the space is not wide enough to require at least two ordinary steps thereon (Art. 222). As main staircases, compound forms are usually arranged in two branches in monumental buildings. It is usual to commence with a middle straight flight, which branches from the landing in two curved arms (Fig. 293). Fig. 313 is a notable example. External straight flights of steps, much as usually entrance and exit steps, are usually constructed with more or less curved steps, gradually becoming wider (Fig. 177).

b. Arrangement and Form of Staircases.

211. Main and Private Staircases.

According to purposes and importance, main and private staircases are distinguished. The first is for public use in most buildings, but the latter is for private use and for the passage of the occupants. As a room for general use, the main stairway must be easily recognized and accessible; only in family and private residences is required a certain separation and isolation. But on entering public buildings, one should not doubt where to seek the main stairway. This does not alone usually suffice, since it generally ends free in the principal story, and it is desirable to so arrange that two flights may not come above each other.

To provide communication with the upper stories, side stairways are placed in larger buildings in addition to the main stairway, and these extend from cellar to attic. As service stairs, they provide servants with access to the housekeeping rooms, so that the main stairway is kept free; as stairs for private use, they are required to directly connect a series of rooms in different stories, but belonging together. Side stairs must sometimes serve for several of these purposes and be planned accordingly. But it is especially the main staircase whose suitable location and arrangement will cause difficulties.

1. Location and Direction.

212. Location of Principal Landing.

In harmony with the internal subdivision of the building, the main staircase is either located at an external side of the building, or more commonly at its center. It may then be partially or entirely surrounded by rooms. This is determined by the location of the principal landing, since accessibility of adjoining rooms is thereby fixed. If the principal landing lies in the interior of the building, then according to arrangement of entrance hall, the space in the ground story is divided in two equal parts, Fig. 299, or in two unequal ones, Fig. 300; both methods permit access to and from the staircase in the three

directions indicated. In most public buildings and in larger business buildings and stores, this separation is not objectionable, but it will frequently be very disturbing in private or apartment houses. Placing the entrance from facade to the side or rear beneath the intermediate landing is only permissible in ordinary or merely useful buildings, or in stairways of subordinate importance, according to Art. 129.

In smaller designs, the staircase and principal landing are placed against an external wall, obtaining the advantage that the rooms form a compact series (Fig. 301). Access to them can occur but in two directions. This arrangement is preferred in French plans, even for main stairways of larger buildings, as it becomes possible to place the windows above principal landing at the same height as other windows of the building. The same advantage is afforded by a location, Fig. 302, together with unbroken connection with all rooms, Fig. 301. This has the defect that passage must be arranged around the stairway, not only requiring much space but also a wider passage for reaching rear apartments. It is therefore seldom arranged in this way (Fig. 291); but is preferable if (Fig. 303) it opens into a court surrounded by porticos, or (Fig. 304) it gives access to several intersecting wings of the building.

The former arrangement is found in Austrian Museum of Art and Industry of Vienna (Fig. 337); the latter occurs in hospitals, etc. According to Art. 126, intersections of compound ground plans are generally suitable for location of stairways, lighted by sky lights, and also when wings of the building partially intersect, as indicated by dotted extension in Fig. 304. The principal landing may give access in the three directions toward the front and also directly sidewise to the passage to the rear. Thus in the School Building, Art. 131, and generally in all stairways placed entirely in the interior of the building. The last building shows that even for this location of the staircase, lighting by direct side light is possible. If the wings of the building form an angle, the staircase is sometimes placed on the line intersecting the angle. There will be chosen either the arrangement in Fig. 306 or the staircase with two branches in Fig. 305. Among other advantages, the last has that of avoiding acute angles toward the stairway in Fig. 306, and one may enter from it either corridor of right or left wing. By arranging it as in Fig. 305 better lighting of the side corridor can be obtained, and a skylight must be provided.

213. Accessibility and Separation.

Various plans in Figs. 299 to 308 show the location to be assigned generally to the staircase with regard to greatest possible ease of access to the main part of the building. Therefore, in large blocks of houses, barracks, etc. staircases are repeated at fixed intervals, are externally accessible, and are

mostly of fire-proof construction. But with accessibility, separation is also necessary in certain cases. Especially in private residences and also in buildings open to the public, like theatres, halls, post-offices, etc., it is important to arrange the connection with the entrance halls, so that those ascending and descending may be protected from draughts. This is more difficult and more necessary, since stairways extending through the entire height of the building are essential for upward ventilation. Wind screens are placed at proper points to prevent draughts.

214. Direction.

Besides the location of staircase is to be determined the direction of the flight of stairs in different cases. Both on entering the building and on reaching the upper stories, one should not doubt how to turn to reach the rooms. This is best attained by ascending staircase directly from entrance without change of direction, and one can directly see the route from the main landing.

215. Beginning and Ending of Staircases.

It is usual to place the beginning of the staircase on one axis of the widely opened entrance hall, and that it may be more clearly seen, a number of steps sometimes are allowed to project into the hall. It is also desirable to have the last flight of steps upward accord with axis of principal apartment of that story. Therefore if a large hall lies in the front of upper story, it is natural to make the arrangement in Fig. 307; if it occupies a part of the rear facade, that in Fig. 308 is a suitable one. In the last case, the room is reached without change of direction; in the first, a half turn is required at intermediate landing. In both, the beginning of the staircase is on the axis of the entrance of the building, the end being on that of the hall.

If one of the halls or principal apartments is required in the ground story, this hall is preferably placed on the axis of entrance hall and entrance, the beginning of the staircase being placed on the transverse axis with a quarter turn to right or left (Fig. 310), so that wide passages beside the stairs (Fig. 308) may then form an attractive approach to the principal apartment, or staircases may be placed at each side of entrance hall (Fig. 272). The staircase is placed unconditionally in the direction of transverse axis, if (Fig. 309) it must be accessible from both front and rear sides, or a carriage passage, with which it is connected, leads through the building. In these and other cases, the plan is frequently symmetrically doubled about the principal axis, the entrance hall being in the ground story connected with two main staircases, which end in the upper story in a common hall (Figs. 310, 310d) or at opposite ends (Fig. 311) to make different parts of the building accessible.

216. Twin Staircases.

The same purpose is served by combining two staircases having a common intermediate landing, as arranged in a number of old and new buildings, and which may be

termed twin staircases. Thus Fig. 310e is one of the two main staircases of Technical High School at Charlottenberg executed with very imposing dimensions, and arranged parallel to main axis along the passages around the great inner court in center of the building and in two stairways, one above the other, to connect with the three stories. A person may start at A or B and ascend the staircase with a half turn in the direction of the arrow A-A or B-B, or travel in the approximately straight direction A-B or B-A. Also the main staircase of Opera House in Frankfurt -o-t-M (Fig. 314).

Two staircases may be combined in still other ways, when their junction is effected at the upper landing instead of on the intermediate one. This may be done when the principal story is two stories above the ground story. Since the staircase may terminate only in the main story, and in accordance with Art. 204, flights are not properly repeated above each other, the design must have such a length, that one must either ascend by a single staircase the entire height from ground story to principal story, which forms the second upper story, or reach the same point by two staircases placed behind or beside each other. The first leads from ground story to first upper story, and at its ending commences the second, which ends free in the principal story. The two stairways are thus placed in direct connection; one extending through the entire height of two lower stories, the other through that of two upper stories.

Such an arrangement is carried out in Technical High School at Munich, and is represented in Figs. 310a, 310b. The entrance to ground story is found on the main axis beneath the story landing. One may thence pass into the first upper story, or by the staircase divided in three branches, to the point lying immediately above it in the second upper story, where is the entrance to the large hall, or may change direction to right or left. The connection with the rooms in the rear is arranged in upper stories by halls at both sides and in ground story by one beneath the stairs.

217. Groups of Staircases.

Extraordinary numbers of people are to be assumed in many buildings, to ensure accessibility to all their parts in different stories. Particularly in theatres, concert halls, circuses, etc., it is necessary to regulate access of the public to different parts, especially to provide for quickly emptying the building, and this is done by separate fire-proof staircases, which occur in like number and arrangement of the main axis and lead to attractive entrances. (Plans of Leipzig Hall, Figs. 178, 181).

An example, where with reference to esthetic effect, both suitability and security were both taken into account in its design, is afforded by City Theatre at Riga, by Bohnsedt, Fig. 212. One may pass from entrance hall at p, and also from side entrance at p, to ground story vestibule and to landings at the same

height by means of the other ascents I, II, and III, which lead from the corresponding vestibules to staircases of the I, II, III tiers. These stairs are both ingeniously and economically arranged as twin staircases (Art. 218) in three flights beside and over each other, but are separated from each other by massive partition walls and by landings. From the ground story upwards, the occupant of the I-tier uses the flight c, which terminates at x; that of the II tier first uses flight b, then a second flight carried over c, which likewise ends at x; finally, that of the III tier first ascends flight a, then a second over b and a third flight over c, to land at x. The crowding of the public is impossible if doors at y in the I and II tiers and those at z at height of the I tier are kept closed. Yet there must be openings between the acts, since no other staircases exist for passing from tier to tier and to the foyer over the entrance hall at height of the I tier.

In large theatres (Paris, Vienna, Frankfort-o-M, etc.) a central state railway is placed between the side staircases of the different tiers. In Fig. 313 (Grand Opera in Paris, by Garnier), the side staircases open freely into the halls around the principal staircase and serve for all tiers. The ground staircase is reached directly from main entrance on the direction of the axis and through the great entrance hall from carriages placed beneath the audience room, by two flights of stairs leading upwards. Both steps and balustrades are curved as shown to produce a pleasing appearance of the entire stairway design. In Fig. 314 (Opera House in Frankfort-o-M by Lucae) side staircases are placed in closed stairways. In both, ascent of the main staircase begins in direction of the main axis while access to the tiers and to the foyer is diverted to each side of the building, so that the staircases must turn at right angles to the axis.

The same requirements, direction of flights of stairs at commencement and ending, frequently leading to opposite points of the axis, occur in many other examples (Figs. 317, 317a). On the other hand, the conditions and space at disposal frequently demand that the ending shall be directly over the beginning (Fig. 315b). It remains to refer briefly to certain peculiar forms, composed of winding and straight flights of stairs (Fig. 316). The two-branched portions of these two staircases are in semicircular form with winding steps. The plan shows them at height of the upper landing. This floor of the upper story is partially occupied by an opening to light the lower rooms by ceiling light. Therefore, the type of plan and combinations of the two staircases, one behind the other, is as here represented.

2. Arrangement and Treatment of Forms.

218. Space Required.

Based on investigations made in this Handbuch, staircases are to be arranged

and executed according to the preceding principles.

The space required is first to be fixed, and depends upon :-

1. Ground plan of staircase, whether single or double.
2. Height of the riser and width of staircase.

219. Inclination and Stride.

Commence with the rate of inclination, since for a given height to be ascended the length of the staircase on the plan is thereby fixed. The tread and the riser are both in accordance with the dignity of the staircase and also with its height; they are to be made more convenient for the longer flights, or the greater the number of steps to be ascended in a straight line. Thus the Scala Regia (Fig. 284) has 90 steps in a single flight, 41 steps being between first and second landings, and these steps have 4.75 inches rise to 20.5 inches tread. The staircase in the Ducal Palace in Genoa ascends 35.1 ft. from ground story to principal story by 80 steps, averaging 5.25 inches rise to from 16.2 to 17.7 inches tread, and these are interrupted by two walking spaces, while our more recent and less dignified monumental buildings seldom have more than 20 to 25 steps in a single flight, and less than 5.5 to 5.9 rise to 13.8 to 13.0 inches tread scarcely occurs; with a moderate height of story, two flights of steps usually suffice with 12 to 15 steps each, having 6.7 to 6.9 inches rise for 11.0 to 10.65 inches tread. For servant's stairs, 7.1 to 7.9 inches rise for 9.45 to 7.9 inches tread are permissible, when height of story is not great.

It is to be remembered that ratio of tread to riser must be the same throughout. To effect this and to simplify the figures, it is recommended that heights of stories be made multiples of height of riser, just as the length of a flight of steps on plan is a multiple of the tread, thus requiring heights of the stories to vary slightly. (Not usually practicable). If the number of steps has been fixed, then is to be determined in accordance with the chosen type, the division into one, two or more flights with landings between them. In fixing dimensions, the following points are to be kept in view.

220. Length of Flight of Steps.

As for distances between landings or length of a flight, the extreme limit is given by the examples and results just given. The usual rule that from 12 to 15 steps should be allowed in a direct succession in a flight is entirely correct, for it is based on the usual height of story and of riser, also requiring that at least one intermediate landing be arranged in main staircase in each story. The minimum length of flight is to be not less than three steps. Single steps should not be omitted to break a straight flight, since they are easily overlooked, are disturbing, and may even become dangerous.

If several flights of steps extend above each other to the different stories

with appropriate arrangement of the plan and equal heights of stories, they must have corresponding head room; if heights of the stories differ but little, then in lower stories one or two steps may be omitted from the flights and the width of landing increased accordingly. If the heights of stories are very different, typical forms of space stairs afford means of equalizing them, since in Fig. 309 the middle flight may be entirely omitted and to the landing be given the entire width of the stairway. If the ground story is higher than next story, this may be remedied by prefixing a flight at a proper place. But except for special reasons, equal lengths should be given to flights of steps placed over each other, to ensure that beneath the turns in the stairs there should remain sufficient head-room, not less than two-thirds to three-fourths the height of the story.

221. Width of Flight of Stairs.

The width of the stairs or length of steps is to be greater if enclosed between side walls (box stairs), than if open on one or both sides, and it must also be greater, the further the flight extends in a straight line. This is shown in Figs. 284, 311; it results generally that in monumental buildings a width of stairs from 8.2 to 9.84 ft. is not unusual, and in branched staircases the middle flight is generally still wider. There is also a minimum for stairs in two branches; for a certain width is necessary, even in a private residence, if it be used and is not to appear mean. This may be taken at about 6.58 ft. for the middle flight and at 4.92 to 5.25 ft. for narrower side flights.

222. Dimensions of Landings.

It is a rule for the landing, that its width is to equal the length of the step, or that of the narrower flight of steps in a staircase in two branches. But the depth of landing is to be proportional to length of stride, so that one may take two or three ordinary steps of 21.6 to 23.8 inches each on it. Only then will it make the ascent of the stairs easier, and it is therefore better to entirely omit the landing, than to insert it to the detriment of a proper rate of rise.

223. Lighting.

Lighting is of great importance for arrangement and appearance of the stairs, for a well lighted stairway makes an agreeable and charming impression, just as a dark one produces an unpleasant and inharmonious effect. We naturally have then a feeling of insecurity in ascending or descending. Moreover the stairway usually serves also for indirect lighting of adjoining rooms. Therefore the stairway must under all circumstances have direct light and it should be lighted as abundantly as possible. The usual arrangement with the landing against an external wall causes the lighting of the stairway by side light,

the windows being placed at mid-height of the story, as in Figs. 299 and 300. This will therefore be made apparent properly by projecting the intermediate landing and stairway beyond the front of the building on the exterior; thereby obtaining more space for development of the design in the interior. But the windows of the stairway are not to be placed at the same height as those of the rooms; they should be placed above the principal landing and this should be against an external wall as in Figs. 301 and 302. For a landing or flight of stairs to cut across the glass surface of the windows is inappropriate and ugly.

In lighting by a skylight, it is to be remembered that if the staircase extends through several stories, intensity of the light in the lower story is naturally much reduced, and it is further greatly lessened by the shadows of the flights of stairs. As in Art. 207, not only must a plan suitable for admission of light be chosen, but the lighting surface must be made very large. Requirements frequently differ greatly and must therefore be obtained in different cases. In the staircases extending through the two lower stories of the Federal Capitol at Winterthur (Fig. 310d), the ground story is sufficiently lighted by the high side light passing down from upper stair hall through two openings in ceiling of lower hall, which together have an area of only 97.2 sq. ft., or about one-nineteenth of the floor area of the room. In the House of the Museum Society at Stuttgart (Fig. 309) the area of skylight amounts to 173 sq. ft. or about one-seventh, and is admitted through well-holes between middle and side flights of the stairway; the last example also shows how sky light may be utilized for directly lighting adjoining rooms. In designs for sky lights, care must be taken to provide sufficient ventilation of stairway in accordance with Art. 103.

224. Treatment of Forms.

Variety in architectural appearance and effect of the staircase is first fixed by the ground plan. The staircase ascending in a closed stairway appears different from that combined into a spacious design with the entrance hall, portico, or porch. The treatment of the staircase hall is also to be distinct from that of the stairway. Treatment of the forms is very varied, according to whether flights of steps are entirely free beneath or are supported by piers, columns, or vaults (For vaults beneath stairs and their decoration, see Art. 172, Figs. 228, 229) or are supported by walls at one end of the steps, or extend between entirely solid walls (box stairs).

It is less necessary to consider differences in form produced by construction and building materials, as these have been discussed and have been illustrated by the examples. The balustrade or railing always follows the inclination and the changes of the flights of stairs. This is aided by regarding

each flight as a part by itself; for even with a considerable length, the different steps only appear as unimportant architectural members; by their succession they aid one in estimating size of the room and height of ascent, the landing affording a necessary pause for the eye. The intersection of the flights and the inclined balustrade with the structural parts of the stairway occasions difficulties. It is simplest when the flight of steps is built free in the room and ends there, and the pleasing and quiet impression thus produced is attained in no other way (Figs. 310b, 317a). If the staircase is built against one wall, the subdivision of the latter usually follows the inclination of the stairs. The wall surface is divided in panels and is also animated by moulded joints or by horizontal bands and mouldings ending at the height of the story. Smooth materials, capable of polish, and not easily injured by use, are especially appropriate therefor. If the flight must be carried along a series of piers or a colonnade which replaces the solid walls, it is advisable to treat the latter in accordance with its division into stories, disconnecting the strings and balustrades so far as possible. We should proceed thus, if as in Fig. 308, such free supports are required for supporting corridors or porticos which are frequently arranged around the openings for the staircase. Treatment of the forms is most difficult, when intermediate strings must be supported by piers or columns with or without inclined vaults connecting them.

When the stairs end at the height of the story, the upper portion of the stairway is sometimes freely developed above (Fig. 240), or is sometimes surrounded by the corridors. According to requirements, these are not only arranged on one or two opposite sides (Fig. 290), but usually on even three or four sides of the room (Fig. 311), and these not only serve for connecting surrounding rooms, but also have a very fine architectural effect. They afford charming views in the stairway and of the persons moving thereon. Especially in this upper part, the stairway is frequently treated as a kind of corridor and is then usually furnished with appropriate paintings and other ornamentation. The noblest architectural effect to be produced by combination of stairway and entrance hall has been most successful in numerous modern buildings, designed after older Italian models. This is shown by the Angerer Palace in Vienna (Fig. 307) and Technical High School in Munich (Figs. 310a, 310b) also Grand Staircases of the Opera Houses in Paris (Fig. 313), in Vienna, at Frankfort-o-M (Fig. 314), etc. That a derivation of motives from the Italian cortile contributed thereto is shown by the Grand Staircase in state hall of new Palace of Justice in Vienna (Figs. 317, 317a) and others.

Chapter 3. Designs of Courts.

225. General.

Like all other uncovered parts of the site, courts have the primary purpose of ensuring light and air to the buildings. They further aim to arrange a connection of the parts of the building on the ground level. This end is served by this area, usually uncovered, laid out, leveled and drained. According to location, they are distinguished as fore, unner or rear courts, and according to importance and purpose, as main or side courts, light or kitchen courts, courts of the offices, stable yards, etc. The latter courts serve only for purposes of utility, chiefly occuring in residences and farm buildings, therefore needing no discussion here or more than reference to their treatment later.

But the design of the former is required by the architectural organism of the work and forms an inseparable part of the entire building, frequently being even an internal room therein, when entirely or partially enclosed by the building, and it is sometimes roofed. This kind of court, which belongs to the entrance and passage rooms of the structure, remains to be described as supplement to those. Its importance in architectural designing is self-evident, and this becomes more so by a brief retrospect of the historical development of courts.

226. Historical.

The temples of the Egyptians were furnished with spacious courts, enclosed on two, three or four sides, sometimes by single or even by double porticos (Fig. 318). These externally closed fore-courts removed the temple proper and sanctuary from the view of the people, but gave place in Greece to the open temple precinct, access to which (Fig. 319) was sometimes through a lodge with portico and magnificent portal, or a propylea. The court of a Greek house formed the central part of the building, of its life and activity. However simple and ^{tasteless} the exterior of the house, the interior must have been made rich and pleasing by its splendid effects of lighting, by picturesque views in the courts, animated by ornamental shrubs and plashing water, and by porticos with their splendid paintings and sculptures. The atrium and peristyle were usually small courts in Roman houses; several kinds may be distinguished, according to construction and arrangement, and they were furnished with a water tank, in which a refreshing fountain was placed when possible (Fig. 320). Noble courts were constructed in the baths of the Roman imperial period, partly as places for games, partly for other purposes, and they were furnished richly by statues and art works. These courts frequently ended in semicircular or segmental form and were generally enclosed by promenades or porticos.

The fore-court or atrium of the Early Christian basilica was usually surrounded by a portico and at its center stood a fountain for ablutions before entrance to the church. The atrium also served as a burial place (Fig. 321).

The mosques of the Arabs were also furnished with similar fore-courts. With these picturesque designs are included mediaeval cloisters. They were surrounded by buildings with cloister aisles in the lower stories, behind which were the halls and other rooms of the monastery. One of the finest examples exists in the Monastery of Maulbronn (Fig. 322); the cloister adjoins the north aisle of the church and is enclosed on the remaining sides by halls and other rooms of the monastery. But fortified courts of mediaeval fortresses and castles appear otherwise, but belong to a different subject, which cannot here be pursued further.

But it is especially in the creations of the Renaissance, particularly in the courts of palaces and other prominent Italian buildings, where must be sought models for present use and for transformation of these elements of architecture. Consideration of a few typical examples will be useful in the following study of arrangement and treatment of courts.

a. Arrangement in General.

227. Location.

Courts are arranged in plan and elevation according to their purpose and to the conditions. The ^{special} purpose fixes the location before, within, or behind the building, then the formal treatment, and within certain limits, their space dimensions. The arrangement and treatment are different for a fore-court, from those of an inner-court; for a principal or state-court, or for a side or rear court. With regard to the relation of the court to the rooms for communication, in order to bring the staircase into convenient connection with the court, the corridor or entrance hall should open towards the court, and access to it is to be made as easy as possible. Side courts require separate entrances. Otherwise the location of the court and its connection with the plan depend on the form of the building, and it will here be only so far treated as required by a study of the design of courts.

228. Ground Form.

The rectangular plan is both simplest and most suitable. Yet, as in the following examples, polygonal, circular, elliptical, or other forms composed of straight lines sometimes occur. On irregular building sites, it is usually best to give the court a regular form. (Art. 235 and Fig. 323). The court is sometimes open on one or more sides, or bordered by promenades, and sometimes is entirely enclosed by buildings (internal courts). The surrounding parts of the building are also variously treated, being sometimes in one, sometimes in several stories. The chief purpose of most courts, the possibility of introducing abundant light and air, is naturally best fulfilled by having at least one side freely open for their admission. In many kinds of buildings, as in hospitals and insane asylums, prisons, barracks, etc., no

other kind of court is permissible for sanitary reasons.

229. Dimensions.

Determination of its space dimensions is also of importance, especially in case of enclosed courts. If the buildings surrounding a court are very high and the court is not wide, sufficient light will not enter the lower rooms and the air stagnates and becomes impure in them. We therefore first consider the ratio of height to the width and certain minimum limits of these dimensions, not expressed in absolute numbers, but fixed with reference to climate and form used. Beneath the sunny sky of the South, shade and coolness are required, and in the inclement North, protection from wind and cold. Therefore much smaller dimensions suffice for the court in warm countries, than in cold regions, where it must be more open to the rays of the sun. It is generally assumed in Germany that the height of the building around the court should be about one-third the width of the court. This is only possible in rare cases and is only necessary, when the entire extent and height of the court are easily to be seen at a glance. Even then the given ratio is only to be taken as an average one. For a court arranged like a public square, serving for free entrance and surrounded by great monumental buildings, requires a greater width than that given. Thus the magnificent square court of the Louvre in Paris has for its side about $5\frac{1}{2}$ times the height of the lowest wing, built by Pierre Lescot under Francis I and Henry IV.

Yet a width equal to twice the height suffices for the court, when the observer can take a position to see perfectly and appreciate the entire architecture of the court facades. But this ratio is seldom attainable in inner enclosed courts. In Italy, where courts may be narrower, we find the width equalling or exceeding the height only in the grander designs. The proportion of equal height and width appears to have been intended in courts of some noted buildings of the Renaissance period. These are sometimes square, sometimes rectangular, as in the beautiful courts of Giraud, Farnese, and Borghese Palaces in Rome, and that of Hospital d. Incurabili in Genoa, while they are sometimes higher than wide, the elegant court of Cancellaria in Rome having the ratio of about 8 to 7, and the court of Strozzi Palace in Florence that of about 8 to 6. But in most Italian courts, the width is only from $\frac{3}{4}$ to $\frac{1}{2}$ the height, or even less.

As for the absolute dimensions of height, from observations in different acceptably lighted courts and from comparison, in Germany an architecturally treated court with minimum sufficient lighting should have a clear width of not less than 29.5 ft. to 32.8 ft. with a height of at most 39.4 to 52.5 ft. The eye can here see but a portion of the interior at a glance. With so great a height, it is necessary that light entering through glass roofs should in

nowise to be obstructed by the structure of the roof.

230. Section.

For courts enclosed by high buildings, the arrangement in Fig. 223 is also employed for better introduction of light by making the court larger at the top. If the court be rectangular, its ends may be higher than its sides; the given proportions may be approximated in this way.

L. Enclosed Courts Partially surrounded by buildings.

231. Fenced Courts.

Permanent enclosure of a square makes it a court; access is obtained through gateways, and within the enclosure or in direct connection therewith is the building. According to the mode of enclosure, these courts are capable of the most varied treatment. Where the court adjoins an open square or street, the enclosure consists of a wall with or without entrance gateways, and where there is no wall, it has an enclosing fence of metal, either iron or bronze, of monumental design. Piers and columns supporting vases, spheres, etc., are placed at suitable intervals to decorate the fence, and their forms must be suited to the architecture of the gateway. The portal and carriage entrance are sometimes treated like a triumphal arch or frequently as deep gateways with living rooms for the gate-keeper (Fig. 259).

Decorations appropriate for open squares, such as columns, obelisks, statues or groups, fountains, etc., are equally appropriate for large courts of this kind. Where several courts adjoin, merely an open grille is generally preferable for separating them; the impression must be that of a single court divided into several parts. For a separation, as well as to enclose the court, instead of a solid wall or open grille, porticos are arranged on one or more sides, especially on the front side and they are left open on both sides or are enclosed by an external wall and left open next the court. Courts arranged thus occur in many buildings of antiquity and in recent structures, the latter being attached to casinos, to exhibition buildings with promenades, etc. A most notable example of a large court surrounded by porticos is that of the National Gallery in Berlin (Fig. 324). The temple-like appearance of the building and of its entire surroundings is made especially effective by the design of the court. Taken in this sense, architecturally treated cemeteries should likewise be considered as courts surrounded by portico-like passages, walls against which monuments are built, etc.

232. Fore-Courts.

But courts are not usually enclosed on all sides by mere fences, buildings adjoin them on one or more sides. This is the frequent arrangement found in palaces, noblemen's seats, etc., where instead of placing the main building directly on the street, it is set between the court and the garden. Low

front buildings sometimes form the enclosure next the street or the passage to the facade, Fig. 325, but wings or subordinate buildings generally enclose the court on both sides, Figs. 327, 253, while it is enclosed on the other side by walls, grilles or porticos. In designs of larger buildings, besides the principal court, several lesser courts are provided, mostly for servant's use. The advantages of this design, such as quiet location, distinguished external appearance of the principal building, etc., are evident.

A still greater heightening of effect, peculiar to some French palaces of the end of the 18th century, is produced by arranging several successive courts, flanked by buildings on both sides, widest next the square or the street, and diminishing in width towards center of main building. The court of Palace of Versailles is executed thus with an extremely dignified and beautiful effect (Fig. 328), however monotonous its architecture may be in other respects. To the Chateau of Louis XIV (by Mansart), we pass through a great fore-court enclosed by a rich grille, at the sides being two buildings originally intended for ministers (Court of Ministers). A second court succeeds (Court of Princes), then a third and still narrower court, which again leads to the last and smallest court (Court of the King), next which were placed the sleeping apartments of the King.

233. Rear Courts.

Quite a different character, more attractive if less pretentious, is produced by having the court extend behind the principal building, instead of before it. We first consider the arrangement introduced in Italian villa architecture, especially in Florence and Rome, where the court is combined with gardens. This is illustrated by the Villa Albani (Fig. 199). Another beautiful example is the court of Pitti Palace (Fig. 328). In the background is placed the entrance to a more elevated garden, in a grotto-like niche being a fountain. The ascent to the garden is by means of steps winding around the grotto in quadrant plan; in the middle is a landing, from which another straight flight leads to the top. A court design of highest elegance is at the charming Villa Pia in the Vatican. Fig. 330 is its ground plan; Fig. 329 is a view of the oval court forming a terrace. In the rear and at one end of the smaller axis is the Villa, in front and at the other end being a portico opening along its sides by colonnades. This is externally in two stories and rises from the lower part of the design in the middle of a basin, down to which one may descend by ramps from two small and lofty portals flanking the terrace court. Courts of most palaces in Genoa have low buildings at the rear or open directly into gardens, which enrich the courts by special decorations and are also usually raised higher than the level of the court, thereby affording opportunity for decorating the rear of the court by terrac-

ed slopes and fountains. Where conditions of the ground permit, one should never fail to realize such advantages.

c. Enclosed Uncovered or Glazed Courts.

234. Courts with Porticos.

In this kind of court must be clearly retained the distinction in Art. 225 between courts for useful purposes and those serving both convenience and luxury. We will consider the latter. They are like the atrium of the antique house and are considered as an inner room thereof, if the rooms of the house open freely into the court or are connected with this by porticos surrounding it. While for fenced courts, or those but partially surrounded by buildings, walls, grilles, and porticos chiefly occur as enclosures; in internal and covered courts, they usually extend around one, two or more sides in each story so as to form a connection with the interior. This design was especially favored by the climate and acquired a typical importance as a cor-tile in Italian buildings.

235. Ground Plan.

Its addition to the ground plan gives rise to very different forms of plans, Figs. 331. to 337, which especially differ in their connection with entrance, and in the location of entrance, entrance hall and stairway. The staircase sometimes commences directly in the entrance hall before the court; it sometimes leads directly into it, and may lie at one side or on the main axis at the rear of the plan, etc. In the last case, it belongs as much to the court as to the adjacent parts of the building, and it is generally arranged in two branches in the buildings of the best Renaissance period and in later examples. These Italian models were imitated in many courts of the Renaissance period in German free imperial cities, connected with the South commercially (Figs. 334. 335). Like analogous French and English examples, these were modified to suit climate and customs.

236. The Elevation.

The elevation of this court with porticos and galleries corresponds to the division into stories and generally exhibits several stories of piers or columns of different orders set above each other, sometimes connected by horizontal entablatures or by arches, an arrangement, whose application to the exterior of the building has already been described in Art. 152. Loggias or galleries in the highest story usually have a colonnade with horizontal roof, while the lower stories have arcades. The reverse arrangement also occurs. In the first case, to retain the axial distances of lower story causes some difficulty, since colonnades with horizontal entablatures like the antique produce very wide intercolumniations. To avoid this defect, the colonnade sometimes extends through the two upper stories. This does

not to give a truthful impression of the internal arrangement and is scarcely to be used in court designs, since the proportion of the upper order of columns then require such a distant point of view for the observer, that it can almost never be obtained in inner courts.

But the arrangement in Fig. 323 is occasionally found, as in the court of Monastery St. M. della Pace in Rome, where on the lower arcade piers stand the cross-shaped piers of the upper story, their intervals being divided by slender columns, which merely subdivide the openings like window mullions. Still more commonly, especially in Tuscany, the upper openings are entirely undivided and the columns are spaced with wide intercolumnations corresponding to the lower axial division; but instead of the stone architrave, wooden beams are placed above them with strongly projecting cornices supported by rafters. This arrangement is an entirely proper structural one and satisfies esthetic feeling, since it is based on the lighter forms of wooden beams.

We have to mention courts surrounded by porticos at the ground level, their upper stories being enclosed. All such courts are very appropriate for reception of monuments, ornamental fountains, statues, sculptures, and of colored decorations even if in a limited degree. Without abundant means, we may at least create a view from the entrance hall into the court, and enhance the picture by planting this with ornamental shrubs, by designing a fountain or a niche with a figure or vase, on the axis through the entrance, which are motives seldom omitted in an Italian house.

237. Glazed Courts.

To accord with their primary purpose, courts shall be freely open and especially uncovered. Thus were they alone employed down to the most recent period. Yet courts surrounded by galleries, if constantly exposed to wind and weather, are not as well suited for ordinary use in colder northern countries, especially for comfort and ostentation, as is the case in warmer southern regions. Therefore open loggias or galleries, which surrounded the courts of older Renaissance buildings, were later mostly enclosed (Art. 187), and they were almost entirely omitted in the works of the following period. Glazed corridors or entrance halls were introduced in their place. Men learned to treat courts enclosed on all sides without porticos and galleries, like the external architecture, and to give them a richer decoration and characteristic expression. This appears in the court of Louvre in Paris, the court of Old Royal Place in Berlin, etc., which have the greater area required for such treatment.

238. Glass-Roofed Courts.

By progress in all technical branches, men have been enabled in recent times, to entirely cover large sized courts with iron and glass, effect-

ively protecting them from injuries by the weather, and also supplying adjacent parts of the building with the necessary light. Ventilation is usually effected in glass-roofed courts through openings in their sides and roof, but it is sometimes materially aided by heating apparatus. The roofing and warming of inner courts not only produce greater comfort for the occupants, an advantage in cold countries not to be underrated, since alternate warming and cooling of external walls almost entirely disappears, reducing loss of heat to a minimum, but heating of the internal rooms of the building is made easier and relatively cheaper. It has thus become possible to give courts of more recent buildings both an importance and such a treatment, without detriment to their main purpose, that they may be made approximately equal to the noble designs of antiquity and of the Renaissance period.

The structural organism and the treatment of forms are essentially the same as in those models, and the portico has particularly come into use. Differences in arrangement and treatment are produced by the varied purposes of our courts. Those courts are preferable found in buildings intended to fulfil the requirements of the modern era for purposes of trade and business, for public purposes, for assemblage of great numbers of men, etc. Their use is especially common in banks, post offices, railway stations, hotels, and places of amusement; also in court houses, legislative buildings, city halls, and frequently in school buildings, etc.

We have here to distinguish the following:-

a. The glass-roofed court, open to common use and accessible by carriages as in some hotels (Fig. 228); it then forms an enclosed public square or place, which usually has the same character as the architecture of the streets and is paved or asphalted.

b. The festival, state or show court, like a hall with a sky light, and thus really used as an internal apartment of the building, as in Austrian Museum of Art and Industry (Fig. 337) in Vienna, hotel "Kaiserhof" in Berlin (Fig. 338), Arsenal in the same city, Technical High School (Fig. 310e) in Charlottenberg. The porticos and galleries of the court then combine with the entrance hall and stairway, are designed in harmony with internal treatment of the building, and are treated like rooms for communication, being decorated by mosaics, marble slabs or tiles or even as a kind of winter garden. If the staircase is built free in the court, (Fig. 317) it may be designated as a stair-court.

c. Like market and business halls, the court may serve as a lazaret and be

surrounded by shops, vaults and warehouses; or it may be used as an exchange and exhibition hall and be correspondingly treated, as in house of Architect's Society in Berlin (Figs. 339, 340), where the court is surrounded by galleries in the two upper stories, communicating with adjacent apartments.

The last two classes generally require the entire ground area of the court only in the ground story with but moderate height, corresponding to its width and length. The glass roof then includes the second or third upper story, but this does not prevent it in certain cases from occupying the entire height, or the glass roof proper may be arranged above the roof surfaces of adjoining buildings. Here belong smaller and larger designs, whose lower stories are used for business purposes, usually as glass-roofed apartments, but their upper stories merely serve as light courts and sometimes have galleries. This makes it possible sometimes to utilize the corridors on the ground level as covered rooms, over a part of these introducing into upper stories the required light and air. Many notable examples are found in business buildings of the modern period. Other important court halls, as those of court houses, post offices, city halls, etc., belong sometimes to one, sometimes to another of the forms mentioned above, everywhere manifesting variety in purpose by the arrangement, construction and form.

Chapter 4. Designs of Large Halls.

239. General.

Every large internal room enclosed by walls and ceiling is termed a hall, whether it forms a separate structure or is ^{an} essential portion of the building. Many halls, especially those of extraordinary dimensions, are often briefly designated as "Halls", especially when they serve for general purposes. In nearly all prominent buildings for public and private use, the hall occurs with greater or less dimensions, sometimes as a room for general use, sometimes as a state apartment opened to a larger circle of visitors on festive occasions. Therefore the hall will be considered as the last, though not the least of the rooms comprised in this Division.

a. Typical Forms of Halls.

According to the special purpose they are to serve, halls exhibit great diversity in detail and in general in their forms. But certain principal kinds may be distinguished, and their types may ever be found in the noble buildings of antiquity.

240. Antique Basilicas.

The elongated building of simple rectangular plan first acquired great importance in the antique basilica. This became the motive for churches, cathedrals, and for numerous halls, in the later periods. The basilica is referred to Grecian origin; from descriptions of royal halls at Athens and in oth-

er cities of Greece by Grecian writers, we may assume a certain similarity of their design, to the Roman basilicas. The name basilica was first applied by the Romans to covered halls adjoining the Forums, which served for meetings of merchants, for sittings of courts of justice, and for public business of all kinds. Yet Roman basilicas are not built after a generally accepted model, any more than any other kind of buildings. The remains of pagan basilicas vary from the rules given for them by Vitruvius.

however it may have been with details of the design, it now appears to be settled that the Roman basilica was a rectangular hall, probably with closed sides, and usually with such a width that to cover it, it was divided by rows of columns or piers into three or five aisles. The middle aisle then was considerably wider than the side aisles (three times their width according to Vitruvius), and was almost always higher, so that a high side light could be introduced into the center aisle over roofs of side aisles. Galleries were usually arranged over side aisles, the upper columns being lower and with high balustrades next the center aisle. On the main axis and usually at one end, though sometimes on the side, was a raised space enclosed by balustrades, the tribunal, which usually took the form of a circular or polygonal niche. Subordinate rooms frequently adjoined this. The basilica was generally covered by a horizontal ceiling, but was also vaulted.

The Basilica Julia in Rome was of large dimensions (Fig. 341) and may be taken as a type of the true commercial basilica, but the Basilica of Constantine in Rome (Fig. 342) is to be considered as the type of an antique state hall. The former is characterized by the omission of a tribunal niche and by the existence of numerous subordinate rooms along the longer side of this five-aisled basilica with piers. Worthy of note in the plan of the Roman basilica is especially the extending of side aisles around all four sides. It is evident that the Basilica Julia could have had only a horizontal ceiling. Not less characteristic is the Basilica of Constantine, whose center aisle is covered by a colossal groin vault of 82 ft. span, divided into three bays, the side aisles being covered by three tunnel vaults at right angles to the axis. Their abutments relieve the thrust of the groin vaults; below their springing points were arranged projecting columns.

241. Halls of Baths.

Next to antique basilicas are the magnificent halls of the Roman baths, which have the same expression as the former. The same arrangement of the former. The same arrangement of the Basilica of Constantine is found in Baths of Caracalla and in those of Diocletian in Rome. Fig. 231 represents the principal hall, just as noble in effect as appropriate in construction. This makes possible vaulting instead of a wooden ceiling, securing a decid-

ed advance in architectural treatment. The vaults of middle aisle rose so high above the side aisles, that as shown by the illustration, the hall was lighted by high side lights above side aisles.

242. House Basilicas and Halls.

These examples show that the Romans knew how to develop the basilica and transform it into a state hall. As such, not only in palaces for monarchs, but also in private houses for festal gatherings. Some data on designs of Roman halls are given by Vitruvius, who distinguishes in dining and other halls between Corinthian, or halls with four columns, and Egyptian halls, for he describes the former as having a vaulted ceiling over simple colonnades, but gives to the latter two colonnades above each other, covering them by an ornamental coffered ceiling with windows between the upper columns. In regard to halls for paintings, it is only stated that like halls for speaking, they were larger. Halls for speaking in gymnasia were large open halls attached to colonnades and furnished with seats, so that philosophers could give instruction to or amuse an audience.

243. Theatres and Amphitheaters.

Quite different from these halls, from antique house basilicas and commercial basilicas, were those mighty creations of the Greeks and Romans, the theatre and the odeion, the amphitheatre, the hippodrome, and the circus. Although without roofs, or only covered by an awning, they should not be neglected, since they are typical forms for our designs of halls, nearly relating to them in purpose and form, and are also the architectural works, where the circular building came into use in the most imposing manner. They differ in arrangements due to their uses, so that sometimes semicircular or circular plans appear most suitable, sometimes oval or a more elongated plan. In varied and entirely enclosed rooms, the circular building sometimes produces a peculiar effect in noble works.

244. Centralized Buildings and Church Basilicas.

A very remarkable transformation of this leading form occurred in Early Christian art, especially in ecclesiastical architecture. From Roman state buildings and monuments of the later imperial period was derived the centralized buildings in Byzantium under the influences of oriental architecture, and in the West were produced the basilican churches, doubtless by transformation of the pagan basilicas for Christian worship.

Since we do not have to consider church architecture here, it will only be necessary to refer ^{to} the centralized or basilican form of church, so far as in its chief peculiarities may be recognized elements of forms of halls in secular architecture.

In centralized buildings, the peculiar ground form is at once apparent,

and it is sometimes composed of a regular polygon, sometimes is in form of a Greek cross with merely nave and transepts, or (Fig. 342) consists of a primary square with outer aisles and semicircular apses. The subordinate buildings in Fig. 342 are also noteworthy. The architectural treatment receives extremely effective and characteristic expression by the superstructure, manifested in varied grouping of the principal dome rising above the whole, as well as in vaulting the aisles and corner buildings in two stories (Figs. 33, 33 to 33).

The arrangement of the Early Christian basilica was at first like that of the pagan basilica, but gradually deviated more or less in construction and plan. We may emphasize as essential changes and extensions architecturally, the prefixing of the atrium, the occurrence of transepts with or without a dome over the intersection, the projection of the apse and the development of the raised choir, the later addition of towers, etc. So far as the interior is not vaulted, the ceiling has coffer, is ceiled, or the frame-work of the roof remains visible.

245. Mediæval Halls.

With this reference to ecclesiastical architecture, it should not be said that forms of halls in secular architecture lacked separate development. Especially in the middle ages, the perfecting of vaulted construction exerted a great influence upon treatment of the hall in the palace and in the monastery, in the castle and in the city hall, even though wooden beam ceilings and visible roof trusses remained in use as before, both for covering very wide halls and for lower rooms, where vaulting did not seem advisable or necessary.

The growing community felt the continually increasing importance of city affairs, and of the ecclesiastical orders, and required new buildings with great halls, which the masters of Gothic architecture knew how to adorn with great beauty and elegance. New motives and charming art forms were produced in stone, wood, and bronze, with no really new ideas in construction. Only the mode of lighting can be so designated, in halls of wide span. In case of vaulted ceilings, this was by means of large pointed windows, crowned by external gables, which intersected near the top of the vault. With wooden ceilings the light was introduced through luthern windows, sometimes between the visible trusses, sometimes through sky lights in the wooden ceiling, which was usually of semi-cylindrical form. The usual arrangement of windows for low side light was in most common use, both for vaulted halls and for those with wooden beam ceilings.

246. Halls in Renaissance and Modern Periods.

The architecture of the Renaissance is also inexhaustibly rich in this

respect, not only in fanciful ornamentation, but also in refined development of construction and forms of halls. They were indispensable to every prominent building; according to Palladio, "like public places, which serve for festivals, feasts, presentation of comedies, weddings, and similar amusements, they are therefore larger than the others, and must have that form best suited for many persons to comfortably occupy them and see the proceedings". If this primarily means the hall, which "all well arranged houses have in their central and finest part," it no less relates to halls in the palace and the villa, as well as to well known large halls of Italian municipal buildings and courts of justice, and to old city halls, commercial halls, pleasure houses, etc., in Germany and other countries.

but the modern period makes the most extensive use of halls. For in every sphere of life, in the state and in the community, in art and science, in trade and travel, in the great world and in simple family life, the restless activity of civilization has created new arrangements and improvements and caused new needs and views, embodied in new works of architecture. The design of halls is always of decisive importance. As in older models, designs of halls now produce the principal types of the basilican, and of the centralized building, the latter being subdivided into polygonal, circular, and cross forms. It remains to examine how these transmitted forms harmonize with the aim and purpose of our buildings.

a. Arrangement and Form of Halls.

247. Classification of Halls.

To whatever kind of buildings halls may be attached, they may be subdivided into the following groups, according to the chief purposes they are to serve:-

- I. Halls for the purpose of seeing and hearing well.
- II. Halls for assemblies, festivals, exhibitions, etc.
- III. Halls best adapted to fulfil all these purposes.

The arrangement and form of halls are therefore generally subject to one or more of these requirements, and to the conditions of the problem. The design of the second kind of hall admits of greatest freedom, and that of the first has the least; limitations also extend to halls of the third group. If a room completely fulfils the requirements of good hearing and seeing, it will not generally be difficult to satisfy all other requirements of the design.

1. Limitations of Space and Main Form.

248. Acoustic and Optic Center.

An acoustic and optic center exists in halls intended for good hearing and seeing. In halls for lectures and addresses, it is indicated by the speak-

or's desk; in concert and theatre halls, it is located in the orchestra, or on the stage near the foot-lights. In designing a hall, it is necessary to commence at its acoustic or optic center, and the plan or arrangement of the auditorium or space for spectators are made afterwards. It is evident that an arrangement suitable for the space for hearers or spectators differs much from those suited for the acoustic or optic center, or for the stage. Distinct perception of tones or of the object to be seen by direct rays is only possible within a limited distance from the source of sound or location of the object. These limits are therefore of supreme importance in halls of this kind.

249. Limits of Good Hearing.

The limits of good hearing in the quiet open air have been fixed by experiment. Without further discussion we refer to Fig. 344, where these limits are graphically represented, assuming the speaker to be placed at C. The full line indicates the limit for good hearing in all directions from the speaker in accordance with the well known experiments by Saunders; those of Henry do not materially differ. On the basis of those and similar results, Orth and also Favaro give the simple form of a circle of 131 ft. diameter drawn through points respectively distant 98.4 and 32.3 ft. from the point O, as a limiting line with equal intensity of sound. Even if only approximately correct, yet for our purpose this circle is a sufficiently accurate representation of the limit.

Although diffusion of sound is quite otherwise in an enclosed hall filled with people, than in the quiet open air, where the observer is disturbed by no one, though the influences which result are partly beneficial and partly injurious to distinctness of perceptions of tones, we must accept these results for lack of other data. These are then the limits of good hearing, when the effect of the voice or the tone is not strengthened by artificial means. When these are employed, the limits may be extended much further; but they are to be made much less, if injurious effects of sound are produced.

250. Ground Form of Hall.

The form of space for the audience is derived from the preceding, together with other laws for diffusion of sound. The more closely this form approximates to these distances and limits, within which the voice is heard in all directions with approximately equal distinctness, the better will the room be adapted for good hearing. It follows that the most suitable ground form for halls of this kind is that approximating a circle, after the model of the Grecian theatre, which is chiefly enclosed by a circle. Starting from this basis, the ground forms in Fig. 345 were developed. Beyond the limits of good hearing, the tones are no longer distinctly perceptible by direct

rays and the form is determined in accordance with the influence of the enclosing surface of the room upon diffusion of sound. The same is true of the examples in Fig. 247.

251. Acoustic Niches.

In most intimate connection with the form of space for the audience is that of the locality of the source of sound. This purpose usually is served by a particular space, freely open toward the audience, of a form adapted to give to the sound rays a certain impulse and a certain initial direction, at the same time strengthening them. This may be termed the acoustic or sound niche. Such an extension of the room does not always occur, because the acoustic center is located within the hall itself; either since the addition of a sound niche is usually not practicable, the hall being not exclusively intended for the purpose of good hearing; or for the mode in which it is to be used, a simple platform or a speaker's desk is more appropriate.

252. Other Means for Good Effect of Tone.

For better effects of tones, the enclosing surfaces of the room are to be so formed and so limited, that useless dispersion of sound waves into empty space is prevented, and their reflections may have a beneficial effect. All space unsuitable or superfluous for the purpose of hearing is injurious and is therefore to be omitted in designing the hall, since sound waves would be uselessly dispersed; material and form of the surfaces of the ceiling are to be so chosen, that they may be made useful to the effect of sound (vibrating surfaces placed near the source of sound), and that reflected sounds may be neutralized. For this reason, the most suitable form for lecture halls of moderate size is a quadrant, described from the position C of the speaker, instead of the more common form of hall enclosed by a semicircle; the omission of two circular sectors is therefore recommended, where seats are not desirable. Executed examples of both ground forms are given in Fig. 245. Yet in very large lecture halls, the angle at the center of the first ground form must be materially greater; the angles of the circular sector must also be cut off parallel to the middle axis.

If the preceding principles are decisive in fixing limitations of space for halls of moderate extent, they are much more so in halls intended for great numbers of persons, and which must therefore extend beyond the limits of distinct hearing. If the sound niche is omitted, then by other artificial means (reflector, sounding wall, sounding board) uniform diffusion with intensification of sound near its origin are to be produced. To prevent echos, the use of non-reflecting materials for the most distant parts of the room is to be recommended, as well as to avoid smooth surfaces, the arrangement of forms to disperse sound, recessing and rounding off angles of walls and

of ceiling, etc.

253. Requirements for Good Seeing.

The acoustic requirements of halls have so far been treated by preference, and even if these have not been exhausted here and must be mentioned later, good acoustics is not alone decisive, but other requirements are now to be discussed. For in nearly all cases, a solution of the problem depends upon a happy combination of different properties required in a hall with reference to its purpose. The demand for distinct seeing is in many cases to even precede that for distinct hearing. For many halls are intended only for the enjoyment and perception of the eye, and not for those of the ear (hippodrome, circus, panorama, etc.). If optical requirements have so far been subordinated, this is because they are more simply satisfied than the acoustic, though both usually coincide.

The last is true with the limitation, that in a room where one sees well at all points, he generally hears equally well, though not always the reverse. For one may hear without seeing the source of sound, and with a suitable design of the room, the reflected sound rays also add to the better effect of the sound. To be able to see an object, no obstacle can exist between it and the eye of the observer; the visual ray must pass directly to the object. Even then optical requirements are more easily fulfilled than acoustic. The limit of distinct vision is more restricted than that of distinct hearing. It is usually given at 39.4 ft. from the object, or at 28.2 to 29.5 ft. where very clear vision is necessary, as in school rooms. Yet it is usually not required to restrict limits of space to small dimensions, since many exhibits are calculated for the use of opera glasses, and absolutely distinct vision is not generally demanded by others.

254. Diversity in Arrangement.

In many halls for public assemblies, as in churches, it is entirely sufficient if but a limited visual angle is open to each person with a possibility for him to conveniently see the pulpit and the speaker. The distance from the eye may then be considerable. Therefore these halls generally have a rectangular nave; hearers are distributed over the floor of the hall, and the speaker occupies a place more or less elevated, since he can thereby be visible and be more easily understood at a greater distance.

In lecture halls, legislative halls, etc., the requirement of distinct vision is scarcely less important than that of distinct hearing. For a large room, radially arranged seats are indispensable, since the eye can then be directed exactly on the object; especially in halls for experiments, where the limiting distance cannot be made great. In rooms of moderate breadth and length, slightly curved or even straight seats are sufficient. The platform of the speaker is usually somewhat higher than the lowest of the usually as-

ending rows of seats. But for very accurate vision, the object viewed must not be raised higher than the eye of the observer on the lowest row of seats.

In court rooms, the requirements of distinct vision and hearing vary for different parts of the hall, especially for the various persons engaged in the court proceedings and for the public. In theatres, the entire stage must easily be seen.

If these conditions primarily affect the internal arrangement of the hall, they likewise have great influence on the arrangement and form of the building. Just as in antique theatres, the arrangement of steeply inclined rows of seats in halls is a characteristic element of the structural organism, upon which depend not only the optic, but also acoustic properties of the room. The inclination of rows of seats may not be on a straight line at pleasure, but in a curve, concave upwards, constructed to scale and in accordance with actual horizontal and vertical distances of acoustic or optic center from the eye of the hearer or observer (Isacoustic Curve).

2. Arrangement in Detail.

On the preceding principles are based the limitations of extent of space and the forms of halls, although only in outline. But we will now contrast halls of Group I for good hearing and seeing (Fig. 345) with halls of Group II for assemblies, festivals, exhibitions, etc. (Fig. 346), and with those of Group III (Fig. 347), which serve for all these purposes, and we will then compare them, while briefly treating of other requirements of their design.

255. Lighting.

The lighting of the hall is most intimately connected with the demands for distinct vision. So far as natural lighting is concerned, everything necessary has already been said in Art. 102; the lighting of museums, halls for collections and exhibitions, as well as that of courts of justice and of other halls, will be discussed in later volumes of this "Handbuch". But in many halls natural light is less important than artificial, and the decorative subdivision of the ceiling depends on the arrangement of the lighting fixtures. Some other factors influence the arrangement and form of halls and only require to be suggested here.

256. Proportions and Dimensions.

As for the ratio of height, width, and length, these have no less influence on the acoustic, than on esthetic effect of the room. From diversity in ground form, these relations can only be fixed in each case. It may be said in general that not only relative, but also to a certain degree, absolute dimensions are of importance. Height of the room should not be too great, since an echo might otherwise be produced (Art. 100, rule 2; very suitable for large halls).

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Otherwise, by the construction of rows of seats and of galleries, as well as by niches and other extensions, the ground form of the room is as much changed as its acoustic effect. In halls of Group I, Fig. 345, formed after the model of the antique theatre, so that all sound may pass radially and directly to the ear, the seats are generally stepped, being partly in rows above each other. The height may be tolerably great if the ground surface is of moderate extent.

257. Designs of halls.

Besides examples already mentioned, and the lecture hall of Midland & Birmingham Institute and Hall of Deputies in Palace of Legislative Assembly in Vienna, the following are characteristic typical forms; the Scala in Milan, one of the grandest theatre interiors, famous for its acoustic properties, hall of the Trocadero Palace in Paris, which holds about five thousand persons, and Albert Hall in London, intended for eight thousand, or ten thousand with the highest gallery. Even if defective in acoustic relations, when compared to halls of oblong ground plan, they prove it possible to build halls of this type on the principle of direct radiation of rays, which can contain twice as many persons as a rectangular room, where one is partially compelled to rely upon indirect transmission of sound.

The Albert Hall (fig. 345) has the proportions of about 3 : 4 : 5 and is entirely lighted from the ceiling. The concave glass area of about 136 ft. by 174 ft. and the considerable height of about 131 ft. would produce very disturbing effects of sound, were it not that the velarium (awning) is made in convex form and of solid materials (Fig. 348). To this arrangement and also to wooden wainscoting of enclosing walls of orchestra and galleries is chiefly to be ascribed the satisfactory effect of tone found in the building, both when moderately, or completely filled. These properties are not possessed equally by the festal hall of the Trocadero, although considerably smaller, unless Garnier's expression has become true since it was opened (1878), "that halls eventually become like wine in bottles". The large hall of the new Cloth Hall in Leipzig (Fig. 345) only at its ends extends beyond Arth's limit of distinct hearing. By its form it belongs to the examples in Fig. 346; the proportions of height, breadth and length are 3 : 4 : 8.

In halls of unusual size, especially in those of Group III, and which must be adapted to purposes of the most diverse kinds, the ground form is generally that of a rectangle. Their form is much changed by cutting off or rounding the corners, the ends frequently terminating in circular arcs, etc. These forms are designed to carry the sound further in its initial direction, and the width is accordingly almost always considerably less than the length. This is seldom less than 1 1/2 times the width; the ratio of approximately 2 to 1

more frequently occurs, and even that of 3 to 1 is sometimes reached (Fig. 347). But the height cannot be very great. The lower the hall, the less will be the danger of disturbing effects of sound. The ratio of "height equal to width (measured between enclosing surfaces)" appears to be the limit, which can be reached only in halls of moderate or small absolute dimensions, and can scarcely be exceeded.

Since these halls not only serve for oratorical, musical, and theatrical uses, but also for festal assemblies and for other purposes requiring the free use of the room, the floor of the hall is made horizontal. Yet platforms are usually arranged along the walls, as well as projecting balconies, rows of seats, or galleries, and the latter are either built free, as in the large hall of the Building of the Musik Verein in Vienna (Fig. 349), or they extend to the ceiling of the hall. The latter arrangement frequently occurs with a division into three aisles, and sometimes with one in five aisles (Festival Hall in Karlsruhe; Central Hall of Alexandra Palace in London, Fig. 347). This is substantially the basilican form of hall, where side aisles are in height chiefly divided into platforms and galleries for spectators and auditors. The lower parts of the aisles sometimes serve for communication and lie outside the main hall, as in the City Hall in Mayence (Fig. 350); the gallery is sometimes omitted above and there is only the lower passage, as in the hall of Bourse in Vienna (Fig. 352). Smaller halls of this kind mostly have neither passages nor galleries, or only one at one end. Such an example of important extent, is the winter garden of Central Hotel in Berlin (Fig. 347); proportions being about 2:14:13. Among German designs of halls, this one covers the greatest clear floor area without intermediate supports, even though the clear span of City Hall at Mainz is much greater.

A peculiar form is shown by the concert and festival hall of Casino at Ostend (Figs. 351, 347) but which certainly cannot accord with the requirements of acoustics; at least its arrangement and form in general, as well as location of the sound niche, permit us to assume the nature of the glazed enclosing surfaces, etc. In a few cases, the sound niche, (if used) is placed at the center of the longer side, but it is otherwise always arranged at the rear end. In the designs of halls in Group II intended for assemblies, festivals, exhibitions, etc., one is naturally less restricted, and Fig. 348 shows that all typical forms of halls indeed occur; the choice is partly at pleasure and partly determined by local conditions, and by the requirements of the problem.

As an example of a simple elongated building, the hall of Palazzo della Regione in Padua may serve, one of the largest halls in Italy, with approximate proportions of 1:1:3. The new Vienna Bourse is a basilican structure of very noble dimensions with proportions of about 4.5:5:11. The Glass Pal-

ace in Munich, used as a hall of the largest size for the past ten years, is five-aisled and arranged in cross-form. The same form appears in the relatively very small hall of Hotel Frankfurter Hof at Frankfort-o-M. The festal hall of City Hall in Berlin again has the rectangular form with a single gallery along the longer side, and proportions of about 1 : 1 : 2. A circular building of vast dimensions, the largest clear internal area now existing, is found in the rotunda of Vienna Exposition of 1873; it properly received a relatively low height with a ceiling of conical form. Another circular design of very imposing diameter is the reading hall of the British Museum in London, not intended for acoustic effects and covered by a great dome. The same is true of the small though beautiful rotunda of Old Museum in Berlin (Fig. 352). A notable example of a tetrastylar design with elliptical niches occurs in the reading hall of National Library in Paris (Fig. 353).

258. Dimensions.

Figs. 345 to 347 give dimensions of several halls of various kinds. No acoustic or optic center exists in those of Group II, and therefore the magnitude of the room is not limited in that respect; but it is frequently so in reference to construction, lighting and other points. Dimensions are generally fixed in accordance with the number of persons expected in the room and area required by each person, whether greater or smaller, according to the mode of use. Data on this point will be given later, when this point can be more fully discussed with the different kinds of buildings.

259. Form of Ceiling; Treatment of Forms.

Everything necessary has already been said in regard to form of the ceiling in reference to acoustics, and in reference to construction and treatment of forms in Art. 92, 130 to 135, and 171 to 173. Besides examples there given, forms of cross sections of some halls are represented in Figs. 348 to 351, with internal views in Figs. 352 to 357. The latter illustrate the treatment of the forms, with reference to Arts. 127 to 170.

The great hall of Vecchio Palace in Florence (Fig. 354) is a remarkable Italian example with horizontal ceiling, and the hall of Middle Temple in London (Fig. 355) is a similar one of the Elizabethan era with a visible decorated framework of roof. As forms of halls of the modern period are the already mentioned domed rotunda of Old Museum in Berlin (Fig. 352), with a free colonnade and aisle around it, and the reading room of National Library in Paris (Fig. 353), which may be assumed as typical; the visible iron construction of the ceiling supports nine domical vaults, covered by colored tiles. The section of the hall of bourse in Vienna (Fig. 353) shows an intersecting groined ceiling with a large horizontal middle panel; the hall of building of Musik Verein in Vienna (Fig. 349) has a horizontal ceiling, City Hall in Mayence

(Fig. 350) has a ceiling of segmental arched form with visible iron construction, and Albert Hall in London (Fig. 348) has a domed ceiling. The cross section of Concert hall in Ostend (Fig. 351) recalls Byzantine centralized buildings. A remarkable example of a large hall with galleries and entirely constructed of iron is given in the main hall of Museum of Natural History in Paris (Fig. 357).

280. Location.

A few words remain in regard to location to be assigned to the hall in the building in which it belongs; for one commences with this in designing it according to the principles already developed. The question whether the hall shall be located in a ground or upper story will usually be settled by the requirements of the programme. This decision indeed fixes the entire architectural organism of the work.

Not less important is fixing its location on the plan. The hall is such an important motive for external appearance of the building, that in all cases a prominent position must be assigned to it in the plan. Particularly in monumental buildings it will almost always be best to place it on the main axis, and frequently on the transverse axis of the building also, as in centralized buildings. Yet requirements of suitability and accessibility must not be neglected. (For relation of main entrance and main stairway to that of hall, see Arts. 122 to 215).

We will close this investigation by repeating the last words of Art. 179:—"The highest effect in decoration and the most harmonious lighting should be produced in the chief apartments of the building. In it should be expressed in monumental designs the intellectual significance of the building, in which the form of room, decoration, sculpture, and painting ~~may~~ work together in a harmonious way."

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THE

ARCHITECTONICS

of

MODERN ARCHITECTURE

An Aid in the Solution of Architectural Problems

By Rudolph Redtenbacher

With 895 Engravings on Wood

Berlin

1883

Translated by N. Clifford Ricker. D. Arch.

Professor of Architecture

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Urbana. Ill.

1884

PREFACE.

In the last of four works commenced at the same time and systematically completed, the Author presents to the Public a work, which is based on a thorough study of Mediaeval and Renaissance architecture, and is intended to elucidate the architectural problems of the present day in general and particular, in accordance with the principles of Tectonics (Esthetics). It is in reality a condensation of the intellectual work, that must be done in all architectural designing, so that if the conditions for a solution of the problem are given, one may easily and quickly find the corresponding form or motive. The form finally assumed by this motive depends on circumstances, and is the artistic work of the Architect. The book is at the same time a manual of architectural form and composition.

It is made possible for the architect to connectedly review the more important ideas, to which his problem directly leads, so that nothing essential to the artistic treatment of his design may be omitted; he has only to decide what motive best corresponds to the problem, when merely the leading idea of its form is given.

As in my Tectonics, I assign to construction the first place in the artistic treatment of Architectural and engineering structures. So far as the artistic form may be influenced by construction, I have sought to base it on constructive principles. One, who is guided by the principles of Tectonics, will correctly solve every problem. The result of this methodical procedure is a Renaissance style, modern in principle, more or less similar to the ancient styles and the Italian Renaissance, as well as to Mediaeval architecture. Here reason takes the place of any historical or traditional restraints; reflection decides what is right in any particular case; after reason attains its end, fancy enters on its right of endowing the motive already found with its proper form.

In many cases, I have restricted myself to the rules of the Dresden school, as being that in which Modern Renaissance architecture is most carefully treated, under the guidance of its excellent instructor, the late Professor Hermann Nicolai.

The fine-grained sandstone of Saxon Switzerland is employed for building in Dresden. Hence the dimensions are made as small as possible. Larger dimensions are common in other cities, xx

where harder stones are to be obtained. The usually massive dimensions of the Italian Renaissance are seldom found in our less brilliantly lighted North, which compels us to place the axes of the windows nearer each other. The Italians were compelled to soften the light to a certain degree, while we seek to concentrate it. The dimensions of Italian Renaissance buildings are therefore always either too massive or too weak, buildings are therefore always either too massive or too weak, if directly transferred to the North; too massive, because corresponding to a larger scale of the building; too weak, because intended for a stronger light. In many cases, it is best to be acquainted with a minimum rule, suited to our conditions.

The work will not be found exhaustive; many will miss what they consider to be of great importance, some will possess additional materials, while yet others may find certain portions treated too briefly or too fully. The Author will be contented, if the leading ideas are found usable, and are treated with sufficient fulness. Those persons, who have ever sought to consider abundant materials from a general point of view, will realize the difficulty of satisfying every reader and of writing a work, whose different portions shall be symmetrically developed, neither too broadly nor too concisely.

The great number of woodcuts required for the work, necessitated the simplest mode of treatment. As the book is intended for the use of architects, who have passed through their period of study, it is proper that the sketches should only be sufficient to be clearly understood, just such as are drawn by the instructor on the blackboard with crayon.

For the benefit of those desiring to use the work, who neither possess nor are acquainted with my Tectonics, the most important conclusions of that work are briefly collected; they are leading ideas of decided importance.

Berlin. Jan. 1883.

The Author.

Recapitulation of the more important laws of general Tectonics.

Section 1. Esthetic Principles.

1. The esthetically agreeable is only unity in itself, or a unity composed of many.
2. The mode of connection of the many must either be evident or be easily divined.
3. A deviation from unity is disturbing, if without sufficient reason.
4. With a sufficient reason, this deviation produces a greater pleasure than unity, since it is the beginning of variety.
5. The simplest form of variety in unity, for all visible things, is Symmetry.
6. From a higher point of view, equilibrium surpasses symmetry in agreeableness.
7. The unifying connection of the many excludes everything incommensurable or incomparable, as a disturbing element.
8. From a higher stand-point, the unifying connection of the many must accord with an idea suggested by the whole, we term this requirement, which must be satisfied, that of internal truth.
9. Further, the whole must harmonize with the subject, which it represents, or with the purpose it subserves, and with the means of its realization. This is the requirement of external truth.
10. The agreeableness changes with the component factors, connected with the appearance of unity or variety. The whole must be in harmony with these associative factors.
11. Variety demands contrasts of complementary peculiarities. Contrasts may only occur between comparable things. Contrasts require preparation, adjustment or solution. Groups of contrasting effects may be combined together, thus enhancing the effect of variety and unifying connection. The results of contrasting effects consist in converging or diverging, gradual or rapid, increase or diminution of pleasure or disgust.
12. As in nature, so in art and tectonics, the end must be attained in the simplest way. The complete harmony of form and purpose is the indispensable requirement of all beauty in tectonics, and demands the absolute purity of the external appear-

appearance of the object, as the lowest step of the beautiful, on the one hand, on the other being the agreement of the quality of the form with the purpose.

13. The principle of internal and external truth implicitly comprises the requirement of the characteristic, i.e., of the prominence of the distinctive characteristics of different things; ideal aims require the placing of those things of secondary importance in the background, on reasons of essential propriety or conventionalization, that modification of form, required by the purpose.

14. Symbolization, or the representation of what cannot be directly represented by means of external signs, comprises the personification of general conceptions, of religious ideas, whose reality is only perceptible to the mind, or which are invisible or too great to be seen as a whole, of complex things by a simple token. Symbolical acts, ceremonies and objects, and monuments, are means of expression for the personification of Art.

Section II. The geometrical Element in Tectonics.

1. The point is the symbol of unity because it is the simplest geometrical construction.

2. With a pair of points is connected the idea of symmetry and equilibrium, according to their relation to a horizontal plane, whether right and left, above and below, before and behind it, and whether the line joining them is divided into equal or unequal parts.

3. The point as beginning, middle or end point, focus or centre of gravity, requires special prominence as a unity, in tectonics, where it is the special in the general, and is characteristic. An intermediate point only needs to be accented.

4. The division of a linear magnitude into two or three equal parts is pleasing from its symmetry, or as a group, if the middle part be prominent; if the middle part be less or greater than the side parts, the second group is more pleasing than the first, on account of the accent placed on it.

5. Divisions into three, four or five parts, are pleasing if the middle or end parts are accented.

6. With a division into more than three, four or five parts, the whole loses its distinctness, and its agreeableness diminishes.

7. By division into a great number of parts, the series represents a conformity to law, whose agreeableness increases, if it be composed of periodically recurring divisions and groups, enhanced by interruptions.

8. The grouping of individual points around another may follow a centric or excentric arrangement.

9. The division of a surface may be:- a, linear; b, according to two rectangular axes, or to three axes making angles of 60° with each other; c, according to axes independent of the forms of the elements of the surface; d, centric or excentric.

Linear division of surfaces may occur, which consists of really harmonizing elements, in which both directions are equally accented, right and left of the longitudinal axis, and therefore equilibrate each other, or in which these differ from each other.

10. Division of surfaces according to two or three axes, we term web systems; that according to axes independent of the form elements, we call embroidery, mosaic, braid, lattice, knit, chain, net or cell systems, according to the mode of construction employed.

11. The centric and excentric division of surfaces produce radial and spiral arrangements.

12. A great many regular mathematical curves, never employed in Art, possess a decided esthetic importance as forms of motion.

13. The distribution of points in space may be placed under one of the systems of crystallography, regular, quadratic, rhombic, hexagonal, as well as under the three clinical systems with inclined axes.

14. Spaces may be divided by planes into cubic, parallelepipedic, rhombohedric and tetratedric elements, and by combining these forms, it may be entirely occupied by rhombic dodecahedric elements.

15. With the ideas of above, below, right, left, before, behind, within and without, are associated the ideas of values, and with these are joined those of coordination, subordination and independence.

Section III. Form.

I. The Form itself.

1. Nothing belongs to pure perception, that lies within or

without the form.

2. The more completely the peculiarities of the ground forms are presented to the actual perception, the more favorably they appear to the esthetic sense.

3. The more the characteristic relations of pure perception are changed to actual perception, the more useful will these be in esthetic respects.

4. Crystalline forms are actually perceived by means of the prominence of their angles, edges and surfaces, and this is made possible by the optical peculiarities of the material. To make the axes visible, mark the angles, central points of edges and surfaces, and planes of cleavage, which assists the actual perception.

5. Round bodies only appear in relief through optical peculiarities, and this appearance is heightened by meridians, by drawing generatrices, and by the actual prominence of axes, centres, and foci, as well as of tangential surfaces.

B. Relations of purpose and form.

6. Every form that hinders the attainment of an end is to be avoided in Tectonics; every other one is to be sought, which may further the satisfaction of a purpose.

7. One important condition of the form treatment lies in the capability of combination of the elements of a structure.

8. The capability for separation of a construction may determine its form treatment.

9. The form may be determined by the purpose, in that in general it cannot be found, unless the latter is given.

10. The form may be entirely independent of the purpose.

11. The selection of a form may thus far be determined by the purpose, that by its means the end may best be attained.

12. The form, theoretically most tasteful may be less adapted to fulfil a certain purpose than another, owing to accidental circumstances.

13. A modification of form is permissible, through the possibility of the misuse of the peculiarities of an object for another purpose.

14. Modification of forms may be required by the number of modes of application.

15. The forms may remain constant, even if the purpose be lost.

16. The modification of forms depends on the number and succession of the purposes for which, and according to which, the article may be employed.

17. The capacity for use lessens with use.

18. The construction may be destroyed by a single use.

19. Form may be dependent on an entire series of purposes.

20. If several peculiarities of an object be simultaneously applied to several purposes, its form-treatment is a function of its peculiarities and its purpose.

21. If these peculiarities be employed for different purposes at considerable intervals of time, the form may change in accordance with the purpose and peculiarities.

22. If a series of purposes are subordinated to each other, their succession determines the form treatment.

23. Coordinate purposes require a form treatment which takes both into account.

C. Relation of Material and Form.

a. Relation of Coherence.

24. Forms of uniform resistance are employed for economy of weight, material and work, or of cost; the difficulty of constructing these causes the preference of approximate forms to those theoretically correct. Forms of absolute resistance are not only preferable for all structures subject to intense forces, but are most pleasing, since their capacity for resisting strain is apparent.

25. The use of approximate instead of exact forms of uniform resistance is an expedient for varying and animating the outline, while retaining the same enveloping form.

26. In case of bodies subject to but small external forces, forms of uniform resistance are to be avoided, and more decided changes of cross section are required.

b, c. The Material, its preparation and combination.

I. Building Construction.

A. Building Materials.

27. General laws for the form treatment of building materials cannot be established; they change with the quality of the material and the purpose to which it is applied. But the following are valid in special cases.

Hard stones, wrought with difficulty, should be dressed as

little as possible and be simply treated; if polished, slight curvatures are preferable for small forges, strong curvatures for large ones. Softer stones, like serpentine and marble, may be turned.

28. Hard stones wrought with difficulty, as well as coarse grained stones and porous stones, are generally suitable for those structural uses in architecture and engineering, which are subject to severe external forces.

29. Uncoursed stones correspond to Cyclopean masonry, coursed stones to squared stonework.

30. To save work and obtain a stronger bond, the stones should be as large as possible.

31. Parallelopipedic blocks of stone composing the parts of a structure require a suitable mode of jointing to save material and work; the joints should never be employed as a purely decorative expedient where no joints are required by the construction. Parts of the building may be divided by joints, but the height of its members should never exceed the maximum height possible of quarry bed.

32. The fineness of the grain and the magnitude of the forms employed, as well as the distance from the eyes of the observer, determines the mode of cutting employed for the external surface of the stone, and the direction of the strokes must be suited to the downward flow of the water.

33. The beauty of dark stones is much enhanced by polishing, that of light stones but slightly.

34. The forms of bricks may be similar to those of soft stones, if unburnt; like those of hard stones, if burned.

35. The forms of pressed bricks should be bounded by plane or cylindrical surfaces, or be impressed by a mould.

36. The forms of modeled and burned clay are limited in dimensions, relief and projection, by the shrinkage and cracking of the clay, as well as by the difficulty of an uniform burning, and by the flexibility of the material.

37. The dimensions of a brick determine the dimensions of all ornamental terra cotta blocks, and of blocks of cut stone used in the same construction, and limit the size and choice of forms of section, but admit of a peculiar decorative and constructive treatment, which gives a peculiar character to brick masonry.

38. Cement concrete used as a building material is subject to the same laws as other cast materials, or if wrought after hardening, is to be treated in the same way as cut stone.

39. The working of wood produces parallelopipedic and cylindric forms, turned forms, and reliefs in endless variety, obtained by carving. Many forms can be produced by bending and by pressing the material.

40. The slight strength of wood perpendicular to the fibres requires that the fibres be cut as little as possible, and the form treatment is limited in respect to this point; but in hard and dense woods, this may be neglected, deep incisions and frequent interruptions of the fibres may occur, and an animated alternation of slight and strong curvatures is required.

41. The forms of cast iron are entirely dependent on the mould, pattern, the process of casting and the withdrawal from the mould. It may be said in general, that cast iron is preferable for thin objects, plates or thin-walled articles, that the difficulty of working its external surface requires the casting to be as smooth as possible, that its great strength makes it peculiarly adapted for strongly loaded parts of a structure, for which forms of uniform strength are to be recommended on account of economy of material, as well as strengthening ribs, perforations, and thickened surfaces, in proper places.

42. Wrought iron requires simple and slender forms in construction of as large dimensions as possible, the rounding-off of projecting angles, gradual transitions and diminutions, and in engineering structures a restriction to the use of bars of the usual trade sections and forms.

43. Forged work demands gentle curvatures and smooth transitions, flatness in thick plates, variety in thin ones.

44. Supplementary work on the external surface of wrought iron is to be avoided, unless absolutely necessary.

45. If wrought iron be employed for articles whose strength far exceeds the strains to which they may be exposed, the greatest variety of forms is admissible.

46. Steel combines the good qualities of cast and of wrought iron in the highest degree, and therefore it allows a wider range of form, as well as the use of very thin or very massive

parts, and is especially remarkable for its tempering colors, and a capacity for receiving polish.

47. The excellence of copper consists in its adaptation to all hammered work, with its fine polish and beautiful color, and also the fine color and durability of its oxidations.

48. Brass and red brass unite a special suitability for castings with most of the peculiarities of copper.

49. Lead and zinc may be employed for cast and wrought work, as well as for perforated work in plates.

50. Tin with its silvery white color, bright lustre and resistance to oxidation, is suitable for fine castings as well as for tinning.

B. Building Constructions.

51. Stone constructions are jointed structures, forming walls, supports, ceilings and pavements.

52. Wooden constructions comprise the lengthening, deepening, widening and jointing together of timbers, to form walls, supports, ceilings, floors, panelings of all kinds, frameworks and other structures.

53. Metal constructions are connected by means of rivets, bolts and keys, employed in engineering for form and structure similar to those of wood, and especially in mechanical engineering for moving machines, subject to both force and vibration.

II. Joinery; Locksmith's work. (Metal work).

54. Joinery usually employs boards and scantlings of small dimensions for thin partitions, light ceilings, floors, stairs, doors and windows, railings and lattices, and lastly for furniture. Works in joinery are light structures, whose forms depend rather on economy of material used than on their purposes, and they are connected by panelings, mosaic joints, framings and latticings of all kinds.

55. The works of the locksmith, like those of the joiner, differ from those of the principal portions of a structure in that the element of weight is less prominent than that of strength; like joinery they are composed of bars and plates, of overlays and trimmings, and they likewise possess a wide range of forms. Wrought, bent and stamped, with iron parts turned about a longitudinal axis, bars and plates rolled into volutes and springs, perforated plates, etc., these are the elementary

forms peculiar to locksmith's work.

III. Textile Art.

56. From flexible, tough and fibrous materials, textile art produces wickerwork, woven fabrics, embroideries, knitted and netted networks, chain works, felts, on the basis of the division of surfaces given under II, 9 and 10.

IV. Mosaics.

57. Joinings whose strength depends on a cementing material and whose forms are based on the mosaic system.

V. Metallotechnics.

58. This especially comprises small art works, employing the noblest metals and the finer alloys of copper, in addition to the metals classed as building materials. The processes are the etching of alloys, polishing, chasing, damascening, engraving, etching, gilding and silvering, plating, stamping, incrustation, niello work, filigree work, and the setting of precious stones.

VI. Tectonics.

59. Tectonics in a limited sense produces in a hard material turned and inlaid works.

VII. Enameling.

60. Enameler's work is principally glass making and comprises the treatment of cast and pressed materials, as well as glass blowing, flashed and filigree work, and the art of enameling.

VIII. Ceramics.

61. Ceramics is chiefly the fashioning of pottery, and like all other technical industries employing clay, it is subject to the control by its peculiarities on the one hand, by its remarkable plasticity and adhesiveness and its burning to a porous, friable or glassy mass, on the other by its injurious peculiarities of shrinkage, of being easily broken or bent out of shape, and of being uniformly burned with difficulty.

IX. The Art of Form.

62. The art of form in pure relief is entirely free in the choice of form, only being restricted within certain limits by the material employed.

d. Relations of light and shade.

63. The strength of relief in the form must harmonize with the average intensity of sunlight in the place considered,

and with the degree of brightness of the colored materials, and must also increase or diminish inversely as these conditions.

64. Nearer objects appear brighter than those more distant, and conversely, brighter objects appear nearer than darker ones.

65. As the object is removed from the eyes of the observer, the fine gradations of light and shade are lost, the object appears indistinct and as if vanishing; conversely, indistinct objects appear more distant than if distinct, and the form must be sketch like, to obtain greater distinctness, if it be distant from the observer.

66. Irradiation may cause an exaggeration of form, according to the location of the object, with reference to other bright or dark objects.

67. The optical deceptions of the relations of the dimensions and their direction require consideration.

68. The greater the number of other articles between the observer and the object, the more distant will it appear, the fewer, the nearer will it seem.

69. Transparency of the material lessens the depth of shadows and the relief effect, which diminishes as the transparency becomes more perfect. Transparency represents the light, weak and fragile, therefore transparent materials are not employed for structural parts, but only for decorative purposes.

70. Reflecting surfaces emit widely distributed light rays if plane or slightly curved, or sharp and concentrated rays if strongly curved. Materials having polished and mirror-like surfaces generally exhibit sharply distinguished masses of light and shade, and reflections, while materials of weak reflective powers show soft transitions and reflections; hence the propriety of sharper and gentler curvatures in the form of weak reflecting powers; we permit sometimes one and sometimes the other to predominate.

D. Symbolical Forms.

a. Relative Forms.

I. Limiting Forms.

71. Limiting forms indicate the beginning or termination, or have the relation of nucleus and enclosure. Beginning and terminal forms are:- a, disconnected at top or on both sides; b,

disconnected at bottom; c, connected ends of horizontal struts; d, connected ends of horizontal ties; e, connected ends of supports; f, connected ends of tierods; Disconnected and connected terminations must always express that by their own strength, they have formed themselves so to terminate, or as if their forms rose spontaneously against the resistance. A spiral form of decoration is appropriate for ties and tierods, and longitudinal stripes for supports and struts, and connected terminations have functions similar to those of the human head, foot and hand, since these are opposing and fixing members.

72. Limits of surfaces are to be so formed, that the material may appear self-limited on its edges, or shade off freely towards the centers of openings, or be enclosed by bounding forms of all kinds. Divisions of surfaces require different forms of borders and of adjacent parts, expressing the alternation of the two portions.

2. Transitional Forms.

73. Intermediate forms transform one cross section or direction into another.

74. Arrangements of forms indicate separated yet re-connected parts, and may personify the strength of the connection, the new relations of both parts to each other, of one part to the other, or of neither part to the other; they can indicate preliminary or terminal, completing or free terminal forms, or direction in general.

75. With convexity and concavity are associated the representation of repulsion, aversion and exclusion, on the one hand, on the other, those of admission and reception; the first serve well as bearing, the latter for changing and terminal forms.

76. The divisions will be conceived to be necking and footing, as well as connecting members, in the sense of the decoration of the human body.

77. Separate divisions of groups of members are separated by fillets, coves, rounds and small mouldings.

b. Decorative Forms.

78. The highest application of ornamental forms is, like that of relative forms, to represent the material as if animated, i.e., when the external form corresponds to the purpose subserved. The simplest application is to render a unity or a single

point more prominent. A second application is the characterization of symmetrically arranged points, which are subordinate to a single point.

79. Ornamental forms corresponding to a centric arrangement take the form of wreaths, necklaces, rings, girdles and bracelets; to the excentric arrangement correspond the palm ornament, branches of flowers and masses symmetrically arranged about a focus, certain directions being accented.

80. A third group of ornamental forms are continuous motives for characterizing a certain direction, whereby other directions are made prominent.

Section IV. Proportions.

1. The unit of scale of all human works and structures in Tectonics is man himself, but the mass depends on the weight of the material, increasing as the cube if the dimensions increase in three directions.

2. The permissible limits of dimensions in Tectonics depend on the distance of the object from the observer.

Section V. Coloration.

1. The simple colors are red, yellow, blue; the mixed colors are green, orange, violet; red, yellow and orange are active, green, blue and violet are passive colors. Complementary colors produce the most marked contrasts. Color arrangements have different esthetic values according to the predominance of active or passive colors, to the representations with which they are associated and the brightness, intensity and specific importance. Representations in Tectonics may strongly influence coloration, compelling us to a more restricted choice of pigments then striving to attain harmony, preferably by shading off these colors.

2. Black and white, silver and gold, strongly contrast with colors; black and white modify the degree of brightness of colors by irradiation; metal placed between colors intensifies these contrasts, and if sprinkled over the surface lends a festive character to the coloration, but suppresses the color effect by its preponderance, yet this can only be excelled by the gleam and play of the precious stones.

INTRODUCTION.

By Architectonics is meant the science of the treatment of architectural forms in accordance with the principles of Tectonics (Applied Esthetics).

The building is the problem in architecture, and it serves the most diverse purposes of a habitation, for public life and assemblies, as well as for religious worship.

Since we pass from the special to the general in order to obtain an understanding of the subject, we shall first discuss the parts of the building, next the building itself, and lastly the grouping of buildings and the planning of cities.

Our design in the following pages is always to trace out the motive in a special problem, which offers itself for artistic treatment.

If with Semper, we were willing to recognize the problem of Tectonics in the external covering, we might envelop an object in any decorative covering whatever, which seemed suitable for the purpose on external grounds, but having no real connection with the internal nature of the object. A wall would then be merely the enclosure of a portion of space, like a suspended curtain or mat, and in accordance with the external covering system, the wall might be constructed in any manner whatever, only requiring merely to be covered by any kind of protective coating, on which might be painted, carved or stamped any desired tapestry patterns.

Granting that the covering principle predominates in the earlier architectural styles of the past, as Semper tried to prove, this furnishes no evidence that it would be an inartistic thought to take the construction as the starting point for the structural form. Architecture commences with the construction and stops when nothing remains to build. Hence, we shall pursue the other course and attempt to derive the architectural motive from the construction. If our results sometimes conflict with those of the other theory, we can content ourselves with this, that the adherent to the form theory may also find something of acknowledged value in our discussions; and if Semper not infrequently assumed the principle of construction as a starting point, we shall so far accord with him.

We shall always regard our subject from the technical, hist-

historical and esthetic point of view.

The special topics to be treated are first, the essential parts of a building, space-enclosing and bearing walls, ceilings and their detached supports, floors, openings, a connection of stories, and roofs.

Architectural structures are executed in stone, bricks, wood, metal, and their combinations.

Buildings for various purposes, Grouping of buildings in blocks or quarters of a city, Plans for business buildings and accessories, ending with Decorations for festivals.

Our programme is as follows.

A. Space-enclosing walls.

1. Stone masonry.
2. Brick masonry.
3. External cement plastering.
4. Wooden walls.
5. Half-timbered walls.

B. Ceilings.

1. Of stone beams.
2. Of wooden beams.
3. Horizontal iron ceilings.
4. Visible trusses of wood or iron.
5. Vaults.

C. Supports.

1. Columns.
2. Piers or pillars.
3. Entablatures of stone, wood or iron.
4. Arcades; stone bridges.
5. Buttresses and flying buttresses.

D. Openings in walls.

1. Windows.
2. Wheel windows.
3. Doors.
4. Gates.
5. Portals of tunnels.

E. Floors.

1. Pavements of stone or wood.
2. Floors of stone slabs.
3. Floors of bricks or tiles.

4. Mosaic floors.

5. Floors of cement.

F. Buildings in several stories.

1. Height and character of stories.

2. Bases, string courses and cornices.

3. Stories not separated by horizontal divisions.

4. Galleries, balconies, bay windows, pedestal courses, corbelled constructions, spandrels, balustrades.

5. Stairs.

6. Towers. (Also bridge towers).

G. Roofs.

1. Batter of walls.

2. Forms of roofs.

3. Covering of roofs.

4. Dormers.

5. Ridge turrets.

6. Chimneys.

7. Decorations.

H. Stone construction.

I. Brick construction.

K. Mixed stone and brick construction.

L. Wood construction.

M. Mixed stone, brick and wooden construction.

N. Metal construction. Iron vaults.

O. Mixed stone, wood and iron construction.

P. Arrangement of plan.

Q. Cross section of buildings.

R. Facades. Facades on courts.

S. Kinds of buildings.

T. Plans of cities. Public squares, streets, gardens.

U. Wells and fountains.

V. Memorials. Seats.

W. City gates. Triumphal arches.

X. Bridges, ramps, canals, Basins for water.

Y. Lighting, lamp posts.

Z. Decorations for festivals.

A. Space-enclosing walls.

1. Stone masonry.

All masonry is formed by the superposition of uncut , partly

or entirely dressed, natural or artificial stones, with coursed or uncoursed joints, with the addition of mortar or cement, and dowels or cramps set in lead, sulphur or cement, or the stones may be joggled or dovetailed together. In masonry, the first point to be considered is the bond of the stones, i.e., the laying of one stone on another in such a way that the stability of the wall without mortar shall be as great as possible.

The requirements of a good bond are that the upper stones shall always cover the joints of those next beneath; further that the external surface of the masonry, which is to be regarded as a covering for the protection of the interior, is firmly connected to that interior of the wall by long headers or bond stones, while the other stones or stretchers do not extend deeply into the wall, only serving to fill the interspaces.

a. Rubble masonry of boulders.

Simplest and cheapest, though least durable kind of masonry. Rubble masonry of boulders is very common in countries where stone is quarried with great difficulty; it is composed of boulders found in the beds of rivers or scattered in the fields, or are the widely dispersed erratic blocks, as in north Germany; considerable quantities of Swedish and Norwegian granite are found there, sometimes of large size, as well as great heaps of boulders, probably transported across the North sea from northern countries by ice floes far into the northern plain and deposited there. Such erratic boulders were even carried into Holland from northern Scandinavia by masses of ice, and the entire North sea is paved with them.

Still, though masonry of tolerably round split boulders was much used in the low northeast plain of Germany for mediaeval and later buildings, the broken surfaces being set visible, this imperfect masonry of small stability is entirely lacking in Holland. This rough rubble requires the walls to be of great thickness, and the interspaces are partly filled by spalls, but demand a large quantity of mortar. In the Mark of Brandenburg and adjacent parts are found several old churches, entirely built of this masonry, as well as the lower portions of towers and churches, with the upper parts of bricks. This masonry can be somewhat strengthened and decorated by occasional

courses of bricks. (Fig. 1). But in general it is imperfect and is only to be regarded as permissible in exceptional circumstances, or as possessing some value for subordinate purposes, on account of its primitive appearance. As a covering for railway embankments, it becomes a kind of paving.

b. Cyclopean masonry.

A higher development of masonry consists of irregular stones, mostly uncut though carefully selected and roughly prepared, is found in the polygonal masonry known as Cyclopean since Pausanias, producing firm construction by means of the closely fitting polygonal blocks. Its nature and existence depend on the fact that it is only suited for uncoursed stones quarried in irregular masses. It was frequently used in ancient times in Greece, Asia Minor and Italy for city walls, fortifications, and royal fortresses, possibly because the removal of one or more stones would not cause the fall of the masonry. Semper rightly called attention to the existence in it of arched construction in a latent form. The walls sometimes have a thickness of 26 feet, the largest blocks measuring over 9.75 ft.

That Cyclopean masonry was even employed in the temples of the Greeks is proved by an example taken from the temple of Themis at Rhamnus, a portion of the walls being shown in Fig. 2, with in Figs. 3 and 4 two other specimens of the walls filling the spaces between the side walls of the vestibule; it is evident that the stones are fitted together with the greatest care, so as to obtain unity of effect joined with great variety, this having been erected at the time of the complete development of Doric architecture. In very recent times this polygonal masonry is executed in granite, porphyry or volcanic stones and limestone breaking irregularly, and is employed for walls where an appearance of unusual stability and primitiveness is desired, for example for retaining walls of terraces and slopes, as in the substructure of the Walhalla near Regensburg, the retaining walls of the Black Forest railway, and in the fortifications of Verona, of which a specimen is given in Fig. 5. The quay walls and fortifications of Cologne and other places are built of basalt and trachyte prisms from Siebengebirge and are somewhat similar, being composed of long prismatic blocks of polygonal section.

Similar polygonal masonry of basalt from Vogelsgebirge is to be found in the castle of Münzenburg in Wetterau province.

Polygonal masonry of small blocks with dimensions not exceeding 2 ft. are uncut and chucked with spalls, and are found in the road buildings of Saxony using the diorite from near Plau.

All these kinds of polygonal masonry are in form based on the mosaic system composed of irregular elements, and they produce a very pleasing effect if properly executed, by their unity of idea with great variety.

The Romans always employed masonry composed of wholly irregular small stones bedded in excellent mortar, from which resulted the extraordinary strength of this kind of masonry, the "opus incertum." The angles and edges of the masonry were usually strengthened by brickwork or by blocks of cut stone.

A very perfect polygonal masonry might be composed of right rhombodecahedrons. (Baumeister. Architectural forms for Engineering). These might be of different sizes and also distorted, if so arranged to fit closely, with no interspaces left between them. But the ideal type of polygonal masonry would be the one already considered in Tectonics in the Chapter on the division of space, and composed of similar elements with an absolutely rigid bond. If we examine the two specimens of walls from the temple of Themis at Rhamnus, it is evident that this polygonal masonry fails in two important particulars, which make it inapplicable to detached pillars, and therefore requires the angles of the walls to be strengthened by another kind of masonry. The lack of horizontal courses would cause pillars of polygonal masonry to separate by sliding, and as the masonry tends to yield, a horizontal thrust acts on the inclined beds and must be resisted by firm abutments. A pleasing specimen of polygonal masonry must show as great variety as possible, still retaining a decided union of the elements; this is adapted to the richest possible diversity of form of the elements, not too diverse, with the limitation of their dimensions within two limits, the greater being fixed by the nature of the material, and the lesser by the condition that the polygonal masonry shall not seem to be composed of large blocks with intervals filled by small ones. Since the separate blocks are not only subject to transverse strain as well as to compression, their widths should not

differ too much from their heights. If it is generally correct not to form reentrant angles on long stones, and to use right or acute angles but seldom, to also avoid the meeting of less or more than three joints at a common point; to make but moderate use of triangular or trapezoidal blocks, excluding all horizontal and vertical joints, these forms and arrangements should not be neglected, in order to enhance the variety in its effect.

It appears to us superfluous to require that polygonal masonry should only be employed in walls having some batter, so that one may not fear that a single stone might fall out of the surface of the wall, since polygonal masonry is scarcely used without the use of cement or mortar.

To cut the face of polygonal masonry is an extravagance, a draft may be cut around the margin of each face with the width of an ordinary chisel, but it is tasteless to dress the entire surface otherwise than in the most superficial manner. The entire labor should be devoted to a careful selection of the stones and to fitting them accurately together. If the polygonal bond is exceptionally employed with finely wrought architectural details and surfaces of polished stone, as in the temple of Themis at Rhamnus, this might be due to traditional or symbolical reasons. Polished surfaces of Cyclopean masonry are opposed to the character of massive strength and primitiveness. Other considerations are applicable to the pavements of streets like the modern streets of Florence and the ancient streets of Rome, than to Cyclopean masonry, since these pavements are not structures, but are simple mosaics.

In Grecian architecture a kind of masonry was employed intermediate between Cyclopean and rubble masonry, since the joints are partly polygonal and partly horizontal. In Fig. 6 we give an example from Mantinea and two others after Viollet-le-Duc, which are very interesting, though seldom imitated at this time. Many kinds of stone break with approximately rectangular reentrant angles as in Fig. 7; others have parallel beds and oblique ends as in Fig. 8; it was proper to use these natural beds and end joints for obtaining a varied effect in the appearance without too much preparation. Engineering construction is accustomed to work on a large scale and must take

economy into account, may perhaps make use of such bonds with advantage.

c. Rubble masonry of quarried stones.

While the kind of rubble masonry just described was composed of stones of wholly irregular form, quarried rubble masonry is built of stones with beds and laid in courses just as they come from the quarry, or after very rude preparation. The stability of masonry of irregular stones depends on the careful filling of all interstices with stone spalls and good mortar; of polygonal masonry on the exact fitting together of many blocks; that of quarried rubble masonry is dependent on the regularity of bond, the horizontal position of beds, the breaking of vertical joints, and the use of long headers. This kind of masonry is appropriate for stratified sandstone and limestone, for slaty sedimentary and volcanic rocks. No acute angles or edges or oblique joints are found in it; the joints must therefore be properly filled with mortar and the wall be covered by it, if a smooth and uniform surface be desired; the angles and edges must be strengthened with brickwork or ashlar masonry, as in Fig. 9, if they are to appear sharp and distinct and to be strongly coherent.

As in polygonal and also in coursed masonry, the separate stones are only subject to crushing, though this is absolutely true only of entirely homogeneous masonry with all beds horizontal. To prevent the fracture of a stone, its length should not exceed 3 to 5 times its height.

The Romans, and after them the mediaeval builders, were fond of using the herringbone bond or opus spicatum for the external surfaces of walls, built of ordinary coursed masonry. This (Fig. 10) is composed of stones partly from river beds, partly of quarried stones or bricks, and it was employed from the late Roman period until in the 14th century.

We will examine the different kinds of herringbone masonry of brickwork. Since the stability of the bond is not great, horizontal courses of bricks are placed at regular heights. The example in Fig. 11 is found in the facing of the walls of Ravenna erected by Theodoric of Verona in the 6th century A.D.; the masonry is built of stones taken from the bed of the river Adige, mixed with courses of bricks. During the med-

mediaeval period this bond was common in the castles of the knights, and it is occasionally found in churches; we have an example in the castle of Hohenrathia in Graubunten (Fig. 12), in which only quarried stone is used.

Other examples are found from the 10 th to the 12 th centuries in the walls of the city of Fulda built in 1166, in Regensburg and Würzburg as well as in other cities, none of which are later than the 12 th century. This herringbone bond was long employed in brick construction as in the mediaeval opus spicatum. Fig. 13 is from S. Ambrose at Milan and Fig. 14 is from Verona, fragments of cylindrical tiles being used in the latter.

The angles in this form of masonry always required to be strengthened by ashlar or brick quoins, with horizontal beds. It produces rather the impression of great stability against sliding than that of great strength.

By the use of quarried stones with parallel beds, some kinds of bonds are possible in addition to those ordinarily employed, and which were used during the middle ages and may still be recommended as being a simple means of increasing the variety in appearance of the masonry; we refer to quarried rubble masonry with courses of different heights, like the tufa masonry of those portions of the church of S. Gereon at Cologne erected during the 11 th century, as well as in the substructure of the castle of Meissen begun in 1478. (Figs. 15, 16). All these kinds of masonry are suited to local conditions, to the materials obtainable, and to the purposes to which they were applied.

A mode of treating quarried rubble masonry employed in the Roman period, and imitated in the early middle ages, deserves mention here; it consists of the use of stones with irregular beds and without true end joints like tufaceous limestone; Very thick joints were filled with mortar so as to make the masonry even and smooth, regular end joints being later incised in the soft mortar (Fig. 17). This kind of masonry is found until the 12 th century in the walls of churches, fortresses and the walls of fortifications, and it is still used in the vicinity of Evreux, where only volcanic rocks are commonly employed.

If the quarried rubble masonry of the middle ages was strengthened by ashlar at its angles in both plastered and unplast-

unplastered walls, it was usual to have no vertical end joints between these blocks and the wall, but irregular ones. (Fig. 18). This gives a picturesque character to the masonry, which is sought in all economically constructed buildings as the only means of obtaining a simple and Tectonic treatment. The Renaissance first abandoned this method and constructed masonry of a very regular series of ashlar blocks. All kinds of irregular masonry, comprising Cyclopean and those kinds forming the transition to ashlar masonry, bear the character of unpretentiousness, necessity and economy; the Roman and Renaissance builders applied to them as well as to roughly wrought ashlars the terms "rustic", boorish or rural, as a distinction from the regular and smoothly dressed masonry of the more prominent buildings of cities. However inappropriate may be these terms, they are not easily replaced by better ones. To soften the effect of this unassuming but picturesque masonry by representing the joints, either making them as thin as possible or by giving the mortar the color of the stone, is the error of a narrow-minded pedant, never adopted in any good architectural style. The irregularities of the masonry require a good bed of mortar, and this bed must be visible as evidence of the durability of the masonry. To subordinate the joints is to dispense with the only means of securing a certain variety in appearance without too great cost. Unity must be sought, not in uniformity of appearance, but in the principle controlling variety, and which must appear unless the work is to seem insipid, without character and weak, qualities unfortunately too commonly preferred by the modern architect and engineer to the picturesque, natural and strong.

d. Ashlar masonry of small stones.

A mode of construction common in all Roman provinces is die work, a kind of incrustation on walls, composed of small pyramidal stones 3 to 4 or rarely 6 to 7 inches square set with broken joints in a very thick coat of mortar (Fig. 19).

This die work is interrupted at intervals by courses of bricks deeply bonded in the wall. This masonry is especially common in Gallo-Roman buildings, but it long survived the fall of the Roman empire in central France; the only known examples of it in Germany are the Clara tower at Cologne and the imperial

palace at Treves.

The Roman network or opus reticulatum is allied to this die work and is composed of pyramidal blocks of tufa, 3.5 to 5 ins. square (Fig. 20), a specimen of which from Pompeii is given in Fig. 21. The network and the die work are specially ornamental bonds for facing concrete masonry. They are seldom used in recent times excepting for paving streets.

A kind of masonry composed of small and regular, but rudely cut oblong stones with thick joints, was in general use by the Romans in France and Germany; this so-called paving masonry was also much used in mediaeval structures and is still preferred in countries furnishing easily wrought materials, like the Brolthal tufa and the variegated sandstone of the middle and upper Rhine provinces.

e. Ashlar masonry composed of large stones.

Ashlar masonry proper will next be mentioned, and it requires to be considered in three ways; mode of preparation of the stones, the bond, and the means of fixing and clamping the ashlar together.

a. Mode of dressing.

If the blocks of stone are quarried with powder, fire, or a row of wedges, they are wrought to form dimension stones, i.e., blocks of prescribed dimensions with approximately rectangular surfaces, still rough and uneven, leaving about an inch to be cut off on each side to obtain a true and even surface, the so-called "working inch." The first dressing is done at the quarry, where the block is laid on a low bunker and the larger projections are knocked off with a sledge^a (Fig. 22). The surfaces are then dressed with a steel pick showing parallel strokes. The axe or point c is then used. The axe has a long handle and is used with both hands. The point is struck with the wooden mallet d, or with the hammer in cutting granite.

When the pointing is completed, the surface should be tolerably true in all directions. The top is then laid off in rectangular shape with red chalk, and projections of the edges beyond these lines are knocked off with the sledge. The four edges perpendicular to the wrought surface are then cut and tried with the square, the other surfaces being then dressed from their edges toward their centres. The stone is then called a

rough or pointed ashlar.

The second process in cutting ashlars is dressing the edges of the face with the chisel and gallet, making a so-called draft along the edges with fine parallel strokes, the four drafts forming the margin of the face. The merely pointed surface of the face is dressed with the crandall b to produce a pointed appearance. Only the faces of ashlars are usually crandalled, beds and joints being left pointed. In case of hard stone, granite, syenite, etc., the bush hammer c is used instead of the crandall, being made entirely of steel with 16 to 40 pyramidal points.

The third operation in dressing stone is droving with the wide chisel d, held in the left hand like the point and chisel and struck with the mallet. This produces fine lines on the surface. Sometimes only the drafts are chiselled.

The further smoothing of ashlar is done by finer chiseling; finally the stone is also well polished.

Therefore the modes of preparing ashlars and cut stone in general are; rough hammering, pointing, drafting and crandalling, chiseling and rubbing.

From the method of dressing stone explained here are derived the starting points in the treatment of ashlars, especially of their faces. It is evident that the beds and end joints must be pointed sufficiently fine to lie moderately close on each other, thus avoiding the use of too much mortar.

A drafted margin of the ashlar is the simplest mode of cutting to obtain external effect, and is the least that can be accepted; The panel then receives the treatment suitable for cut stone. As stated in general terms in the Chapter of Tectonics on cut stone as a building material, this treatment depends on the specific peculiarities of the material used, its texture, its conchoidal, slaty or splintery fracture, and the resulting difference in external appearance, so that each material has its proper mode of dressing. Since the chisel used for marginal drafts has a fixed breadth and this is used on large and small stones, this constant width modifies the effect of the ashlar, making large blocks seem to have narrow drafts while small stones have wide ones. The projection of the central panel varies according to the dimensions of the stone and

purpose to which it is applied. Their projection on the ashlar of the massive Pitti palace in Florence are so great, than one may find shelter from rain beneath them.

This simplest mode of dressing will always be satisfactory when economy of labor is required, as in substructure walls, utilitarian structures, engineering works, fortifications, etc.

The pointing of surfaces is the second mode of treatment; pointed panels on ashlar contrast with those roughly dressed, where a different mode of cutting is desired to express a different and finer quality of masonry. This is especially common in the treatment of the mass of a structure. If the base of a building is of ashlar with rough and strongly projecting bosses, the lower story may be constructed of pointed ashlar.

According to the greater or lesser projection of the bosses, of ashlar and their more or less fine pointing, several grades in appearance of masonry are possible. In both pointed ashlar and those with bosses, drafted margins are necessary to clearly mark the joints of ashlar; on the one hand to give the ashlar a general appearance of having at least received the minimum preparation permissible. If the drafted margin be entirely omitted, the ashlar lose their characteristic element of form.

Grandalling the surface of the ashlar is but a transition or an intermediate between pointing and dressing; it should be entirely excluded from architectural work because not beautiful. Either the stone should be chiseled if the cost is allowable; or if not, it should then be left rough or fine pointed. Bush hammering in case of very hard stones signifies the extreme limit of smoothness usually permissible, especially on engineering works and fortifications. Finally, chiseling is usually the highest limit of preparation possible on fine-grained stone and the best cut stone; The drafted margins almost entirely disappear as the chisel strokes are cut away. The stone is very seldom rubbed, only in case of fine-grained material of good color, capable of receiving a good polish.

In contrast to the ashlar composing the wall in which we use the most diverse modes of treatment to characterize the masonry, it is natural that for moulded or ornamental cut stone the projecting bosses are to be avoided; the best cut mouldings and ornamental blocks being wrought from fine-grained materials as

a rule, for which a finer treatment is suitable; if considerable work can be saved on similar ashlar, this economy entirely disappears in the best cut stone work, since these are seldom duplicated, or one may seek a saving on the ashlar to have more for the ornamental blocks. It is tasteless to form bosses on architectural details.

The Greeks and Romans set stones partly rough dressed and partly with bosses. after completion of the structure, these bosses were wrought into members and ornaments. Hence many ancient buildings were never finished; for example the temple at Segeste in Sicily, parts of the Coliseum in Rome and the Porta Nigra at Treves.

This mode of building was in part traditionally retained in Romanesque architecture of the 10 th to 13 th centuries. The ashlar and most architectural details were set finished as supplied by the masons' lodges, and only special parts like bases and capitals of columns with many of the more elaborate ornaments of cornices were cut after being set in place.

Consequently many portions of buildings in Romanesque have likewise remained incomplete until the present time. Examples are in the cathedral at Maintz.

During the Gothic period from 13 th to 16 th centuries, the cut stone was always entirely finished in the sheds of the masons, and it was therefore set in a perfect form. The Renaissance masters after the middle of the 15 th century followed the ancient method in a peculiar way in accordance with their views; since they did not possess a thorough knowledge of classic antiquity, which we owe to many scientific investigations in modern times, and therefore they were unable to correctly explain all appearances, they accepted everything in good faith as found in ancient structures, and employed it in the same way, assuming incomplete work to be perfect and imitating it. In this is the explanation of many peculiarities of the Renaissance. In future we shall learn to recognize this.

If one desires to build economically and to quickly attain a certain end, he employs for the substructure of a building small or only the most necessary care, so as to devote all his power and artistic skill to the more important parts of the structure; this was also the case for all ancient temples and other structures. The first thing is to place a layer of stones

on a rocky foundation on which the building is to be erected. Gigantic blocks with dimensions even surpassing those of prehistoric stone monuments ascribed to a race of giants, were laid in the courses of the temple terrace at Baalbek, blocks 68 ft. long and 14 ft. high being used; it is easily conceived that the beds were but rough dressed and the margins were drafted, leaving the projecting boss in the state in which it left the quarry, merely removing the greatest projections.

The Romans entered on the heritage from past historical periods, adopting the methods of all predeging races and introducing them in all countries under their rule; we therefore find this rusticated masonry employed in all Roman structures in Europe and the adjacent parts of the earth.

During the middle ages this masonry with projecting bosses was merely used in fortifications and is generally rare; smooth masonry was preferred in this time. It first reappeared in the 15th century in the palaces of Florence; it was assumed to have been invented by the Etruscans, ancestors of the Tuscans, and for that reason alone was made a special feature of the Tuscan Renaissance. An attempt was made to harmonize the most diverse modes of cutting the stone with the orders of columns, so as to express by means of ashlar masonry the character of the orders in the treatment of the masses of the buildings, even when without columns or pilasters. This was finally carried so far, that in imitation of unfinished Roman buildings, columns and pilasters were even composed of rectangular or cylindrical ashlars with surface bosses, an error that should never be imitated at this day. To artificially imitate the imperfect is without meaning.

A special form of this ashlar masonry with bosses appearing in fortifications at the end of the 15th century is the spherical boss, suggested by the use of artillery; Viollet-le-Duc, in his *Dictionnaire d'Architecture*, Vol. 2, p. 217, gives an example from the gate tower of the walls of the city of Vezelay, erected under Francis I between 1515 and 1547.

The Renaissance architects invented the so-called diamond paneled ashlars, i.e., when a drafted margin surrounds a boss with the form of a low pyramid. If the blocks are rectangular this is called a diamond panel, if square a nail-head panel.

We give in Fig. 24 an example of this diamond paneled ashlar masonry from a church in Naples, with a second example in Fig. 25 composed of alternating ashlars with diamond panels and with spherical bosses from the old fort S. Giovanni at Florence. A variation of the motive of this paneled ashlar, which may be required for richer structures as well as for the bases of monuments with the use of polished stones, etc., consists in moulding the margins (Fig. 26) and also in the truncation of the pyramidal bosses. Certain blocks like the corner stones of the base of a monument, the keystone of an arch, etc., should be more richly treated and moulded, but then one must be careful not to approach too closely the forms of joinery.

A decorative treatment of the surface itself of the ashlar, as well as all over refined modes of cutting it is objectionable, as being an expenditure of means in an improper manner; for the same cost at which it is sought to ornament ashlars with all kinds of niceties in the art style of the Barocco period, we may more richly furnish the architecture with decorative or sculptured ornament, or we may employ nobler materials. Yet it should not be forgotten that in purely decorative works like portals, monuments, etc., such a decoration of ashlars by ornamental patterns may be permissible in exceptional cases.

To mould the margins of the surfaces of ashlars leaving the bosses in their rough form is a contradiction, the rough bosses being esthetically justified by both their bold effect and their economy; yet if the means suffice for moulding the ashlars, it is preferable to change the bosses into diamond panels. Such a contradiction would appear like affectation.

The simplest means for causing the joints of the stones to have a bold effect consists either in causing the surfaces of the ashlars to project beyond the face of the wall and form rectangular joints enclosing the surface of each block (Fig. 27, a,b,c,d), or to give the joints a triangular section, sunk in the face of the wall (Fig. 27, e).

The actual structural joint is formed by the bed of the stone in the first case, so that the projecting surfaces of the ashlar protects the structural joint from the penetration of rain. To replace the edges of the projecting surface by chamfers, quarter rounds, coves or mouldings, would greatly increase the

cost of the masonry, but it would also increase the richness of appearance of the joints, and is therefore to be limited to those parts of buildings, in which an increase in expedients is desired as in substructures, accentuation of angles, etc. At the surface of the wall from which the ashlar projects, the joints themselves should not exceed the width of the chisel and it must be constant; if the effect is too slight for large blocks, the joints can be made wider outwards, their sections being trapezoidal (Fig. 27 a).

Triangular joints usually have a right-angled section when executed in the usual materials; their effect is more marked if their surfaces make an angle of 60° with each other (Fig. 27, a, b, c); when this diedral angle exceeds 90° , they seem broad and also have a weak effect. Fixed rules for the proportions of ashlar joints cannot be given, since their effect must always harmonize with the purpose to which they are applied. Taking the breadth of a chisel as a basis, in case of a richly moulded joint (Fig. 27, a, d), the smaller fillets, chamfers and mouldings must have such dimensions as may be required by the effect of light and shade, and by a varied alternation of proportions of magnitudes.

To treat all ashlar joints as being purely ornamental, where no structural joint is required and not letting the real joint appear, is one of the greatest barbarisms borrowed from the Barocco architecture by modern architects. Architecture disappears with construction; one requires the other, and whoever does not understand how to develop the nature of the former from the latter, can never place himself beside the mediaeval masters nor yet beside those of the best Renaissance period, who were first of all good constructors.

The second great barbarism of modern times is to imitate ashlar joints in cement; cement plastering has no limiting dimensions like cut stone, which usually is in courses of 18 to 24 inches high, but its dimensions may be arranged at pleasure; therefore in dividing cement plastering those dimensions and projections should be used, which differ as widely as possible from those of ashlar masonry. Stucco belongs to the plastic and hardening materials, whose treatment should correspond to the means employed in giving it form. The imitation of ashlar

in stucco exactly destroys and falsifies the structural meaning; Whoever becomes accustomed to such forms no longer knows how to use cut stone and transfers to it the formlessness of stucco whenever possible.

In conclusion, it should be remembered that for purely decorative purposes, the arrangement of ashlar in mosaic patterns with congruent elements is not excluded, on Palladio's famous basilica at Vicenza is to be found such ashlar masonry of marble in scale-like patterns employed on a wall beneath stairs. (Fig. 28).

γ. Ashlar bonds.

The most natural and unconstrained kind of ashlar bond, which is both best and most picturesque, is that in which the stones are cut and set just as obtained in the quarry, without attempting to arrange them in regular courses or to make them of a uniform height.

We give in Fig. 7 a specimen of Greek masonry and add a similar example of Roman masonry in Fig. 29. In case of stones quarried with good beds but cut in long pieces as in porphyry, this random ashlar bond is very appropriate, especially as it is one means of producing economy, also for use in bases and substructures supporting works of all kinds, fortifications, etc.

A transition to regular ashlar bond consists in making the courses of unequal (Fig. 30) or of equal height (Fig. 31) but using stones of different lengths (figs. 30, 31). Since ashlar are subject to transverse strain, the lower blocks must also be shortest to avoid fracture, and the higher may be longer, but generally the lengths of the blocks should be as supplied by the quarry. The Roman, mediaeval and early Renaissance architects always preferred this natural ashlar masonry, thereby obtaining both an inexpensive and picturesque masonry. The correct principle is to always work in accordance with the materials provided, and so that they may be used for the most diverse purposes, as in case of the normal brick form, predominant from the Roman era until the 16th century; the High Renaissance first introduced uniformity in the height of courses and in length of stones, which was usual in Grecian temples.

The bond of similar ashlar generally resembles that of brick masonry; the proportional dimensions of ashlar depend on

the materials employed and the height of courses; their length may vary in direct proportion to the strength and height of the ashlar. The simplest system of construction is that where the stones extend entirely through the wall; then, 1, the courses may vary in height; 2, the length of stones may vary, thus producing the following possible combinations (Fig. 32); a, courses of equal height with stones of equal lengths; b, courses of equal height with stones of unequal lengths; c, courses of unequal heights with stones of equal lengths; d, courses of unequal heights with stones of unequal lengths.

If a wall consists of square blocks and those with lengths of twice the side of the square, the following bonds are possible (Fig. 32); e, courses of equal heights with square stones, (Fig. 33); f, courses of unequal heights with square stones; g, courses of equal heights and stones alternately square and oblong; h, courses of unequal heights with stones alternately square and oblong.

If these eight different arrangements are examined, assuming the low courses to have half the height of the high ones, the relative cost of labor on bed and end joints per unit of superficial area of the masonry will be as follows:- a, 48; g, 52; b, 56; c, 63; d, 63; e, 64; h, 73.5; f, 84. For economic reasons then a, b and g are preferable; c, d and e are most expensive, but equally so; f and h are the most costly of all these bonds. The bonds b and g are most pleasing of those least costly; d is the most pleasing of the more expensive, and e is the most uniform of all the bonds; f and h are dearer and are ugly, but h is that most full of variety though appearing too fanciful to excel the others in producing a pleasing effect by its diversity. These bonds with stones extending through the wall are nearly similar to those composed of separate bond stones, which extend through the entire thickness, and other blocks only occupying a part of its thickness, usually composed of two stretchers (Fig. 34, i, k), or a space is left between them and afterwards filled with ordinary masonry (Fig. 34, l). Preference should be given to F 34 k instead of F 34 i, since the wall is entirely built of stones of equal size, and the length of a bond stone is determined by the thickness of the wall, one half this being its side.

It is easy to see that in case of the most commonly employed bond, the greater the number of headers used the more labor and expense are necessary, though the wall is stronger, hence they are sparingly used, a header being inserted after each third stretcher in the heading course, two stretchers extending in the stretching course from centre to centre of the headers, so as to give an effect of richness and variety. If the headers are to be made prominent and evident, it will be preferable for sake of economy to finish the stretchers with projecting bosses on their faces, cutting the ends of headers smooth or with diamond panels. The richest of all bonds here mentioned, h, also most expensive, is appropriately used for a royal palace or a any similar building, and if a harder material be used for the lower courses than for those higher, there may be great variety, not only in the form but also in the modes of dressing the stones, if one desires to be consistent to the last degree, the low and long blocks subject to the greater strains should be finished with strongly projecting diamond panels in places most severely strained; the small and less severely compressed headers might be decorated in any way, for example with sunk rosettes if they are of a material easily wrought, or may be cut like precious stones if composed of a hard stone susceptible of a good polish (Fig. 35, n, o). The central lightly loaded large ashlar might have shallow diamond panels, and the large headers could be finished with hemispherical bosses or be treated like precious stones with crystalline recessed angles as in Fig. 25. If such masonry be constructed without headers although the large square blocks appear to be through stones, and they really hold the masonry together, they should have projecting heads like nails or rivets, which may be shaped in accordance with the hardness of the stone or the possible expedients.

The forms of headers may also be improved in the manner employed by Julian Sangallo in the Condi palace in Florence and as represented by himself (Fig. 36, p, q).

If the masonry is to make a noble yet simple impression, smoothly dressed and polished ashlar of good material will always appear best, and if the best mode of construction is also adopted, the ashlar should extend through the entire thickness

of the wall. This kind of masonry was the normal one in the finer examples of the Greeks and Romans, and was termed *opus isodomum*.

With the increasing smoothness of ashlar ending in a polished surface, we likewise pass to the closest possible fitting together of beds and end joints, so that these entirely disappear if the blocks are very carefully rubbed on each other. If the material be at the same time perfectly homogeneous and its color be exactly uniform, a uniformity of appearance is produced, for which the Greeks did not strive as being the highest ideal of masonry, or they would not have sometimes gilded the joints or have marked them by narrow strips of bronze, which appears an error to archaeologists, enthusiastic lovers of uniformity. It should be stated here that in general ashlar work has entirely renounced the use of square blocks, further that through-stones in very thick walls should have much greater depth and breadth, so as not to be broken at the middle; however a construction like that of Fig. 37 r is admissible, which indicates the thickness of the wall by its higher headers. Very durable stones with good beds, costly stones and those capable of a good polish, are well suited to the so-called plate bond (Fig. 37 s), a peculiar mode of facing walls not without justification in exceptional cases. In veneered masonry backed by brickwork, rubble or concrete, it is evident that if no through stones are used, the courses of stretchers must alternately extend deeply into the wall (Fig. 38, t).

If labor on ashlar masonry is to be saved, a bond having few headers is not only preferable, but the heights of courses must be as great as possible; but if the material is to be economized as in countries furnishing little stone, there is the choice, either of alternating courses of stone and of brickwork (Fig. 38, u) as very common in upper Italy, Belgium and Holland, or of employing alternate blocks of ashlar and brickwork (Fig. 39, v). This kind of mixed masonry is sometimes found in Belgium and France, and a similar specimen of ashlar and rubble masonry exists in a buttress of the castle of Weissen.

This mixed masonry may be suitable for the brick piers of churches in spite of its small resistance, and it is accordingly found in the churches of Holland and southern Bavaria. The

veneering of walls with elements of different forms is to be considered a fancy, which may be seen on many Renaissance buildings of central France, that are covered by mosaic work of different colors. To this is related the Italian marble incrustations of the mediaeval period, which only comprise the covering principle, and it was a merit of the Renaissance to have developed this into a structural principle.

γ. Expedients for fastening and clamping together ashlar.

Stones are fastened together by means of mortar, as well as by projections of the stones, three specimens of which are given in Fig. 40 as shown in plan, or by dowels of stone or metal, by indenting the blocks into each other (Fig. 41), and finally by cramps. These fastenings are generally concealed in the joints between the stones; if cramps do appear on the external surface, they are either treated as external anchors set in lead as in Fig. 42, a, or like Fig. 42, b from the stair balustrade of the bishop's palace at Lucca.

5. Ashlar masonry in general.

The late Renaissance clearly observed some things that have since been neglected. For example, bed and end joints play different parts; while beds are subject to crushing and offer resistance to it, end joints are not subject to any strain; hence it follows that the beds should be made prominent but not the end joints, and one meets with a twofold conflict, for:— 1, all architectural styles must be cast aside, that have accented both kinds of joints as in the best Renaissance; 2, the beds must be made most prominent and end joints be subordinated, it would then be inconsistent to leave both kinds unmarked, since ancient and mediaeval architecture would then be rejected. If only beds are accented, the masonry has the appearance of being composed of continuous layers of stone, which is not at all so.

If we consider the masonry as a construction with a right to appear as such, it would be proper to allow it to appear as a structure composed of parts, where the end joints would take their part as well as the beds; this structure may be characterized most simply by the natural mortar joints and does not need to appear as a monolith in order to produce the effect of unity or of a whole, but the power of unity over diversity must be evident in the structure itself.

For the same reason the joints should be accented by means of the expedients already described, and if it is desired to distinguish end joints from beds, which is only proper when it is desirable to make all the fine structural joints evident in the entire building, with the utmost consistency the end joints may be narrower than the beds and be differently treated.

If we admit the claim of Semper, that regularity of form and similarity of treatment are the supreme requirements for the artistic effect of masonry, on one hand our hands are tied, and on the other the finest structures of the Renaissance are to be cast aside, which owe a good part of their characteristic beauty to irregularity in form and treatment. The same is true of Semper's requirement, that only the substructure as belonging to the earth base, should show the mode of cutting and arrangement of joints, while the structural formation of the superstructure need not be so apparent. We merely have a choice, either to throw aside the Pitti, Strozzi and Rucellai palaces as errors, or of establishing a theory of art by which these structures may be considered justifiable.

By means of the various modes of cutting already described, the forms of the ashlar and the kinds of bonds, numerous expedients are available for giving the masonry a varied character. From the massive strength of the fortress and the roughness of the rural building to the light grace and princely splendor of the palace, the most varied effects are possible in the appearance of ashlar masonry. The absolute dimensions of the blocks and their proportions add their individual effect to the general appearance of the masonry. Square faced ashlar appear bolder than if oblong, small stones are also bolder if nearly square; on the contrary, large stones are so if oblong.

Increased richness in the external appearance of ashlar masonry may be produced in many ways; either by the mode of cutting, by varying the bond, or by refining the bosses by mouldings, rubbing and polishing, the use of better materials, inlays of finer stone or metals, by decoration of joints, etc.

As for the mode of cutting, all affected and formal treatment of ashlar as if the stones were stuffed cushions, like that originated by the Barocco, is decidedly objectionable. No

attempt should be made to enrich the architecture by increasing the labor in any way, and if it is not desired to economize but to lavish labor, it is preferable to give the ashlar a decoration belonging to sculpture.

To accent the bond leads to mosaic work and disguises the structural character of masonry if carried too far.

On the contrary, if it be desired to retain a rich yet structural bond like Fig. 35, o, and to carry its decoration to the highest point as for an altar chapel, a Santa Casa of Loretto, it is permissible to use a more refined treatment of the bosses by moulding, rubbing and polishing, with nobler materials, inlays of semi-precious stones, noble metals, stone intarsias, decorations of joints by gilding with stamped patterns or mosaics. A memorial or a public fountain would justify the use of this kind of decoration. The corresponding sculptured ornamentation and figure reliefs would require a rich treatment.

It not being possible to surpass this richness in decoration, which is permissible in purely ornamental works, we must then renounce the construction, and either think merely of a covering of sculptured marble, like the facade of the Certosa at Pavia, or of incrusting the surfaces with polished semi-precious stones with gilded joints and ornamented by stamped patterns, as in the chapel of castle Karlstein near Prague, or lastly of covering the masonry by ornamented plates of bronze or of nobler metals as done in Greece in ancient times.

A peculiar construction of stone walls may be mentioned here, whose principle is entirely correct and admits of great variety of forms, an example of which is found in the Romanesque church of S. James at Regensburg (Fig. 43); the wall consists of stones not extending through its entire thickness, but so arranged that part project in front and part in rear. The panels are enclosed by an architrave of suitable profile, and the convex patterns on one side become concave on the other. This truly structural motive may be treated in various ways, according to the bond chosen, and thinner and more ornamental enclosing walls may thus be employed.

In contrast to ashlar masonry, whose nature is thoroughly structural, bonds imitating ashlar work in structures of wood,

Dutch stove tiles, wainscoting, metal work, etc., are to be treated if possible, so that may not remind us of actual ash-lar

ashlars. Sunk panels, entirely inappropriate for stones under compression, more richly profiled enclosing mouldings, etc., are not only allowable for structures of materials other than stone, but on the contrary are to be preferred.

Divisions into ashlar on painted or plastered walls must be treated in a purely decorative manner to appear like tapestries sewed together. Each division should be enclosed within a decorative border, its centre being accented by flowers, rosettes and other ornaments.

2. Brick Masonry.

Brick walls were found in the earliest times among the Assyrians and Chaldeans; they used unburnt bricks general laid with asphalt mortar.

The Romans first developed brickwork; by means of excellent clay and superior mortar and cement they rapidly constructed all kinds of mixed masonry of concrete and of backed rubble, where bricks were chiefly used as a facing for the wall; for this purpose they employed partly triangular and partly rectangular tiles, generally using oblong tiles for through courses or headers and triangular tiles for the facing stretchers, behind which the wall was a mass of concrete composed of cement and fragments of tiles or stone spalls. They preferred opus spicatum as well as a kind of masonry where patterns of all kinds were produced by horizontal bands of color or of colored stones.

During the middle ages brick construction was developed in different ways in various parts of Europe, especially in Italy, southern France, Bavaria, the low plains of north Germany and in Holland. Only north Italy and North Germany created a true brick construction, the other countries having almost exclusively employed a mixture of cut stone and bricks.

A bond was used in Holland during the entire middle ages consisting of alternating courses of stretchers and headers, but the lengths of the bricks did not correspond to their widths, so that a regular breaking of joints was impossible in each second course.

The middle portion of the wall is usually composed of rubble. The natural treatment is to lay alternate courses of stretchers

and of headers, and when the end joints fall together, a longer or shorter brick is selected or is suitably cut. This kind of masonry has the decided advantage of cheapness over all regular bonds, and it is therefore to be recommended as a makeshift. It appears picturesque and less pretentious than regularly bonded masonry.

a. The structural Bonds.

Modern bonds are either those used during the middle ages, like the so-called Gothic or Polish and the So-called Dutch or Flemish bonds, or are those introduced in the Renaissance, as the cross and block bonds.

Ordinary modern brick masonry is composed of bricks of equal dimensions, whose thickness, breadth and length have proportions of 1 : 2 : 4, inclusive of the mortar joint, so that four thicknesses and three joints equal the length of a brick. Bats are sometimes used as well as whole bricks as in Fig. 44; half bricks H, two making the length L, quarters V, three-quarters D, and finally split bricks K, two making the width of a brick. Each brick bond is arranged so that the bricks forming the external face of the wall are laid as stretchers or headers, and upper bricks always cover the joints in the next course beneath.

The thickness of brick walls is always a multiple of the width of a brick, so that brick walls alone are in use, that are $1/2$, 1, $1\ 1/2$, 2, $2\ 1/2$ bricks thick. The end joints of the wall face commonly extend through the wall (Fig. 45, a). (Not in U. S). The interior of the wall entirely consists of headers, stretchers being used only on the face. (Not so). If the thickness of the wall equals an even number of half bricks, the courses are similar on front and back (Fig. 45, b); but if uneven, the courses on face and back alternate, a course of headers on one face corresponding to a course of stretchers on the other.

If terra cotta blocks or cut stones are used in brick masonry, their heights must always be multiples of the height of a brick with its mortar joint. These are the most important points relating to brick construction in general.

We shall next consider the bonds of facings of walls, then those at the angles, and will seek the decorative motives resulting from these structural bonds.

a. Block Bond. Fig. 46.

The bond is arranged according to the scheme $\underline{u} \underline{u} \underline{u} \underline{u} \underline{u} \underline{u}$; the end joints of all stretchers and headers alternate over each other; any vertical element of the wall consists of alternate stretchers and headers. An oblique division of the face has the rhythm $- u u - u u$, and a vertical one the rhythm $+ - + - + -$. If the bricks are distinguished by different colors (Fig. 47), the bond forms congruent vertical elements a , between which are left interspaces. Used diagonally with bricks of two colors, the bond is changed into a net system. In horizontal and diagonal directions a multitude of decorative patterns may be produced by the use of bricks of different colors (Fig. 48).

β. Cross Bond.

Like the block bond the cross bond consists of alternate courses of headers and stretchers, but the end joints of stretchers only come in the same vertical in each fourth course and in each second course of headers. The oblique division of the masonry follows the scheme $u u u u$, and the vertical one has the rhythm $+ + * + + - -$. The entire bond may be regarded as a diagonal net system, whose cross shaped intervals are filled. In vertical, horizontal or diagonal directions, this bond consists of merely abutting courses. It gives rise to the most varied decorative patterns, band-like or net-like motives of all kinds (Fig. 50).

γ. Gothic or Polish Bond. (Fig. 51.

This employs stretchers and headers alternating in each course according to the scheme $\underline{u} \underline{u} \underline{u} \underline{u} \underline{u} \underline{u}$; a vertical element has the rhythm $+ - * - + -$, the oblique division with the formula $- - - - -$ being entirely composed of lengths. In a vertical direction the bond may be divided into purely congruent linear surface elements, which fit each other without leaving intervals; in a horizontal or vertical direction into detached courses or diagonally into a net system, in which patterns are produced by separate headers as in the patterns of Figs. 51, 52.

Besides the Gothic bond, a variety should be mentioned common in brick construction in north Germany, the so-called Wendish bond, where two stretchers alternate with one header in each course.

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These mediaeval and other bonds produce a very rich variety of ornamental surface patterns, which are entirely distinct for each one of them.

8. Flemish Bond. (Fig. 53).

The Flemish bond is incorrectly termed Dutch bond because it is in common use in Belgium and rare in Holland, consists of alternating courses of headers and of courses in Gothic bond.

The vertical arrangement of this bond accords with the formula $+ - + - + -$, its oblique division has the rhythm $- u u u - u u u -$. The end joints of each second course of stretchers and of each second course of headers lie over each other. In a vertical direction this bond consists of purely congruent linear surface elements without intervals; horizontally with detached courses, and diagonally of a net system with cross shaped meshes. This bond likewise produces peculiar ornamental patterns. Block bond is the one most commonly and generally employed in masonry.

Cross bond is stronger than block bond on account of the more perfect alternation of the joints. Gothic bond is chiefly used for facings of rubble walls and has less strength than cross bond, and is not as good for facing rubble as a bond composed of stretchers and headers alternating in pairs (Fig. 54), so that two courses together always bond with the backing of the wall. Dutch bond is only used for walls one brick thick.

The decorations of structural bonds are strictly patterns, that always correspond to those of flat embroidery. According to the old Dutch method still seen in a few buildings, the masonry is decorated by borders and bands of various patterns (Fig. 55), which result from the bond itself.

If a bond terminates at the angle of a wall or against an architectural member, it is evident that if it be cut vertically on the lines a b, c d, e f, (Fig. 56) (through end joints or centres of bricks), quarter bats will be required at the angles. In case of the block bond I, the angles will be arranged according to the following rhythm, according to the distance of the left half from the joints a b, c d, e f; denoting quarters by 1, halves by 2, three quarters by 3 and whole bricks by 4; on line a b, 1 4 1 4; on line c d, 2 1 2 1; on e f, 1 2 1 2. The cross bond II gives the following: on line a b, 2 1 2 3 2 1 2 3; on line c d, 2 3 2 1 2 3; on e f, 1 2 1 4 1 2; it is self evident that the angles should be made as strong as possible, and the use of quarters or split bricks should be avoided at angles;

hence each course commences at the angle with at least halves, quarters and split bricks being placed at some distance from the angle. The bonds in cases I and II are arranged by courses as follows, according to the lines a b, c d and e f:-

I.	a b	c d	e f
	1 2 2 2	2 2 2 2	1 2 2 2
	4 4 4 4	1 4 4 4	2 4 4 4
	1 2 2 2	2 2 2 2	1 2 2 2
	4 4 4 4	1 4 4 4	2 4 4 4

II.			
	2 2 2 2	2 2 2 2	1 2 2 2
	1 4 4 4	3 4 4 4	2 4 4 4
	2 2 2 2	2 2 2 2	1 2 2 2
	3 4 4 4	1 4 4 4	4 4 4 4

Removing the quarters and split bricks from the angles, or replacing them by three quarter bats, the bond will be arranged according to the following scheme:-

I	a b	c d	e f
	3 2 2 2	2 2 2 2	3 2 2 2
	4 4 4 4	3 4 4 4	2 4 4 4
	3 2 2 2	2 2 2 2	3 2 2 2
	4 4 4 4	3 4 4 4	2 4 4 4

II.			
	3 2 2 2	2 2 2 2	3 2 2 2
	4 4 4 4	3 2 4 4	4 2 4 4
	3 2 2 2	2 2 2 2	3 2 2 2
	4 2 4 4	3 4 4 4	4 4 4 4

The peculiarity of this rhythmic scheme is easily explained by the fact that the quarters are not only removed from the angles, but care must be taken to prevent two end joints from coming together in adjacent courses.

Of these bonds only that on line c d is customary. If two walls join at right angles, the principle of the bond will also be that in each course A and B, one wall always extends clear through the other, which abuts against it (Fig. 57, A, B). According to the preceding modes of terminating the bonds, the angles are to be arranged so that there may always be as many three quarter bats at the angle as half bricks in the thickness of the wall (Fig. 57), for if but one three quarter were used

at the angle followed by two whole bricks in the header course, the principal rule for bonds would be violated, that the end joints should extend clear through the wall.

If quarters and split bricks were used instead of three quarter bats, the bond would change to the following rhythm, according to the line e f:

Block bond	Cross bond
2 1 2 2	2 1 2 2
4 2 4 4	4 2 4 4
2 1 2 2	2 1 2 2
4 2 4 4	4 4 4 4

The courses alternate in block bond as in Fig. 58. In cross bond the fourth course is as shown in Fig. 59, the others being as in block bond.

The bond varies in the interior of the wall according to whether the thickness of the wall is a multiple of a whole or a half brick, and the principle that each course is continued through the entire thickness of the wall alternately is not strictly retained in cross bond.

In Gothic and Flemish bonds which are properly used only for facings, it is not difficult to make the rhythm of the bond clear.

Gothic	Flemish	Dutch
4 2 4 2	4 4 2 4 4 2	4 2 4 2
3 4 2 4	3 2 4 4 2 4	3 2 2 2
4 2 4 2	4 4 2 4 4 2	4 2 4 2
3 4 2 4	3 2 4 4 2 4	3 2 2 2

If it is preferred to commence at the angles with three quarter bats instead of halves, it is not difficult to make this change in Gothic and Flemish bonds.

What has already been said in reference to the decorative treatment of ashlar masonry is in part applicable to brick masonry, but from the smallness of its elements this can never give the impression of robust strength, but rather like a network suggests the idea of impenetrability by the intimate connection of its small blocks and its proportionally wide joints.

The decorative expedients of the structural bonds are based upon:- 1, the use of bricks of different colors; 2, the greater prominence of the bond at the angles; 3, the projection and depression of separate bricks and patterns; the thickness of the wall may be indicated by the bond at its angles.

Like the stone wall shown in Fig. 43 from S. James in Regensburg, brick walls may be constructed with raised panels on one side and sunk panels on the other in patterns suited to the b bonds (Fig. 60), especially in $1\frac{1}{2}$ to $1\frac{1}{2}$ brick enclosing w walls without cutting the bricks. finally, a part of the brick walls executed in patterns may be left open as in parapets, g garden walls, friezes for admission of air and light into ordinary buildings with thin walls.

b. Decorative Bonds.

When the structural principle entirely disappears as in the various panels and ficings of walls, the most varied decorative bonds become possible; they may be used as facings for each constructive bond with the aid of quarters, halves and split bricks, and finally they may be executed with or without the aid of cut or colored bricks.

The simplest form of purely ornamental bond, capable of producing the most varied patterns, is that (Fig. 61) in which e each stretcher is replaced by two halves so that only a single kind of bed appears on the face of the wall.

An entire series of decorative bonds form true wep systems according to whether the bricks are cut or uncut (Fig. 63).

Joints in brickwork are generally so broad ($1\frac{1}{8}$ to $5\frac{1}{8}$ in.) that their influence on the external appearance of the wall is very decided. In the better kinds of walls they are pointed with strongly hardening mortar or cement, using different profiles according to circumstances (Fig. 64). The modern masonry of Holland is characterized by the use of very small bricks, as well as by having vertical joints not more than $1\frac{1}{8}$ inch thick while the bed joints are very carefully worded to the p profile d, are $5\frac{1}{8}$ inch thick, and are always left white.

It has usually been customary in Germany to color the mortar before using it, so that any desired tone of color may be given to the wall in general by means of the color of the bricks and that of the mortar. The bricks are usually of a broken color, dark brown, black, red, yellow, white, with green or violet obtained by glazing. Whoever has an opportunity of comparing the carefully executed masonry nf different localities will agree that a white or nearly white network of joints appears best when the bricks are of a dark color. Dark joints are suit-

suitable for very light bricks. The older houses of Amsterdam were built of black or peat-brown, as we call deep reddish-brown bricks, but the joints were always left white. It is undeniable that the aspect of such gloomy houses is made as pleasing as may be possible by the joints.

The imitation of ashlar masonry by brickwork, as exceptionally done in the Italian Renaissance, belongs in the realm of Nonsense.

3. External plastering of Walls. (Stucco).

Since external plastering is a protecting covering for ordinary rubble or for brick masonry, it is to be treated as a covering in the true sense of the word, and its range of form is to be sought entirely independent of masonry. All imitations of ashlar and brickwork, whether painted or in relief, are decidedly objectionable for this reason.

The expedients that may be employed for the decoration of external plastering are those of sculpture and painting. Stucco belongs to form-art as already stated, being a soft and plastic mass.

Therefore stucco work is the proper means of decorating external plastering by a division into panels, the enclosing of panels by mouldings, inserted ornaments in cement or plaster, all are admissible, but only with the condition that the series of forms may neither imitate those of stone or of wood.

All stamping or incising in the soft mass is well suited to the nature of the material; the inscription or impression of ornaments, a rude treatment of the surface by hatching or by roughening, by sgraffito or by true painting, gold grounds and gilding of various parts, all are adapted to the plaster surface. A painted and symbolical architecture is preferable, which is no imitation but a free play of form cannot be excluded from the domain of plaster decoration.

Plastering serves no monumental purpose in general; therefore it affords a free play for the taste of the period or individual or that due to the subject, but for this reason must be excluded from monumental structures as far as possible.

One of the many barbarisms of the "periwig and pigtail" period, that we adopted and which has not yet disappeared, is the painting of cut stone and brickwork with oil colors. This is

one of the insipidities of the last century, which must be opposed by all means, but we should not forget that the esthetic sense in its lowest stage of development, as in the case of the general public, sees more art in the cleanness of appearance and in regular and symmetrical arrangement, than in the picturesque; the modern peasant is better pleased by a regular avenue of poplars than by the finest forest, art begins with order and neatness for him as for mankind in general. That he remains at this beginning point, that the great public of cities as well as of entire nations, like the modern Hollanders, can never pass beyond this, one must lament on one hand, but on the other we must consider this love of order and neatness in people as really being esthetic, without which any exaltation to art is generally impossible.

In many cities where the available building materials are scarcely homogeneous, it is often scarcely possible to convince even educated persons, that the natural color of the material, in spite of its irregular and possibly gloomy color, excels a uniform coat of oil color in agreeableness. The reason for this fact is the recognition of order and neatness as a canon of beauty by those persons.

As being important and entirely useful decorations of masonry, we finally have to mention iron wall anchors as well as holders for banners, lanterns, etc., the former being found on almost every old house in Holland, the latter on the palaces of Florence and Siena. Dutch and Tuscan smiths vied with each other in designing tasteful works of this kind, which are to be accepted as true models of a refined treatment of metal.

4. Wooden Walls.

According to construction, wooden walls may be bearing walls like those constructed of horizontal or vertical timbers or of planks, or they may be merely partitions or board walls, palings or picket enclosures, panes or lattices.

a. Walls composed of horizontal timbers.

Such walls are built of round logs or rectangular timbers laid to cross each other at the angles, either with crevices left between them as in the hay barns and sheds of the Alps, or to form walls that are wind and weather proof. The ends of the timbers project beyond the walls at the angles or may

be cut off flush, making the bond visible at the angle.

The decorative expedients for the esthetic treatment of these log walls consist in carving either the joints or surfaces of the timbers; also the projecting ends of the timbers, their bottoms or sides, angles, edges or ends; finally, when the ends do not project the angle bond is itself ornamented. Even if a richer treatment of such walls is found in exceptional cases, these ornamental expedients are always worthy of mention. The true Swiss cottage, Norwegian and Russian churches as well as peasants' houses, which are constructed of horizontal timbers, and finally mediaeval structures of similar kinds employ the most varied forms of carvings in wood.

The carving of the angles of the timbers may be done in various ways, either as mouldings as in Fig. 65, a, or in notches of all forms in repetitions producing patterns of numerous kinds (Fig. 65, b). Carving the surfaces comprises borings and excavations of all kinds, dentils, diamonds, checker-board and zigzag patterns and innumerable sorts of ornaments, with which the surfaces and angles of timbers are enriched. (Fig. 65, c).

One of the best expedients for ornamenting surfaces of timbers is by incised letters, proverbs, etc., or by raising them on a sunk ground.

It is self evident that the bed joints of the timbers can be profiled so as to be tongued into each other (Fig. 66), as found in Norwegian and Russian buildings, whose walls are required to be absolutely air-tight; the ends of the timbers then show the form of bed joint. These ends are free ending and may be shaped in the most diverse ways by carving their sides and ends (Fig. 67), or by carving them in peculiar forms.

Which one of these modes of ornamentation is to be preferred depends on circumstances, the richness of the decoration, whether the structure is to be an elegant temporary building like a pavilion of an industrial exhibition, or is to be as monumental as possible, and is therefore required to resist strongly the effects of weather; in the last case the choice of forms must be quite limited, since complex carvings afford opportunity for collection of rain water and consequent decay of the wood. Russian wooden architecture sometimes employs timbers of hexagonal and not of oblong section (Fig. 68).

β. Walls composed of vertical timbers.

Such walls are almost entirely used in buildings for ordinary purposes, seldom for those of importance. They consist of timbers set vertically and closely joined together by grooves, tongues, etc. (Fig. 69), usually to prevent admission of water. These timbers are driven into the ground, or their ends are tenoned into sills and plates. The idea of decorating this kind of a wall would never occur to anyone. But if it be desired, the joints between the timbers may be covered by moulded battens, be made visible by carvings, but neither to weaken the timbers or to permit entrance of water.

The timbers should be ornamented by raised ornaments between the battens, and the plates or the horizontal beams tenoned between the ends of the posts should have patterns forming bands.

γ. Board walls.

Board walls are almost entirely used for thin partitions; they either consist of a framework in which are inserted panels, or of two thicknesses of boards crossing at right or acute angles and nailed together (Fig. 70), or are composed of a single thickness of planks abutting, tongued together or overlapping, with the aid of vertical posts and horizontal girts.

For two thicknesses of boards nailed together it is most tasteful to lap the joints (Fig. 71), as no crack is then caused by shrinkage of the wood, and moulding the joints with a regular spacing of nail heads has a decided influence on the general effect. If this mode of construction is employed for doors, they should be bordered by strips of sheet metal or be completely covered by it, by leather or parchment; doors of mediaeval churches were frequently treated in this way, and the doors of churches and palaces in the Italian Renaissance were sometimes covered by thin metal. The edges of the border strips of metal may be cut in the most varied patterns, nails be changed into rosettes, or their heads be shaped into large and effective knobs; the plate covering may assume the mediaeval form of horizontal strips, one edge being cut in some form of linear division of the surface (Fig. 72), or be covered by firmly nailed plates as for Renaissance doors, where the nails form a special decorative system, or the whole may be placed under any other arrangement.

Fences or enclosures of boards or planks generally serve merely temporary or necessary purposes, for which an esthetic treatment is not admissible. If they are to be decorated, it is possible according to the mode of construction:- 1, to mould the joints; 2, to cut the overlapping edges of the boards in patterns (Fig. 73); 3, to cut moulded grooves in the boards themselves in mediaeval style (Fig. 74). The upper and lower margins of detached fences are almost always treated like Figs. 73, 75, which are subject to the general rule that forms are to be avoided, that might cause the projections to break off.

To these board fences should be added the parapets and balustrades of galleries, bridges, etc., as well as paling walls. Balustrades as a whole form bands or friezes composed of vertical elements; these are held together at top by a horizontal rail, their lower ends being tenoned into another rail or held together by a pair of strips (Fig. 76), so that the boards may be cut in free ending forms. This cutting of the boards partly consists in widening the joints (Fig. 75), partly in perforations of the boards (Fig. 76). A correct and healthy feeling led the nations who most completely developed wooden architecture, Swiss, Tyrolese, Upper Bavarians, Russians and Norwegians, generally to treat the cuts of the boards with rectangular forms like lace and embroidery patterns, or so to form curved cuts as merely to indicate a free play of line, avoiding determinate forms of plants and animals. For more than one reason, many of the modern fret-sawed forms of our wooden architecture are therefore objectionable, since they imitate outlines of objects in an unsuitable material, that may be painted on but not fret-sawed in boards, and further it is forgotten in the first place, that these cuttings depend on a finely balanced division of the parts removed and left, but never on the repetition of any definite thing.

Only in exceptional cases, wooden brackets, acroterias and similar architectural details are cuttings in wood to be used, which represent heads, animals and plant forms, ornamental objects generally with curved lines, and they are then to be treated with exceptional delicacy. This requirement for wooden architecture is easily justified. The fibres should be cut as little as possible, or at least cut in such a way that parts

of these wooden decorations may drop off; the wood should also form a coherent net system. If it be desired to saw an ornament in a board similar to that painted on by means of a stencil, the fibres are not only improperly cut, but the very refinements in the movement of the ornament, the leaf points and the smaller forms are sawed out with difficulty or incorrectly, as the thickness of the board hinders the free management of the saw. These complex forms of fretsaw designs are only suitable for sheet metal or very thin boards, scarcely employed in wooden architecture.

The sawed out ornaments appear dark or light as a rule and are perforations sunk like black spots on a light ground; they attract attention more strongly than the wood and therefore require form treatment before all else; if it is possible so to shape the perforations that the remaining woodwork assumes proper forms, it is self evident that this is to be preferred. Exactly the opposite of what is here said is true of carvings on boards not cut through; in such cases one has perfect liberty to do as desired. If perforated boards are nailed on other boards to form a kind of decoration in relief, from the fact that the perforated board must always form a net system, the same freedom is permissible as in case of imperforate carvings, since the more fragile portions are firmly nailed. The finest Swiss houses and wooden houses in the Tyrol and upper Bavaria have adhered to this primary law with great consistency; the perforations are almost entirely openings of pleasing shape and arrangement, but the free ornament is used on friezes, panels and similar ornamental portions in the form of a board nailed on. It is self evident that either the perforated or the board nailed on may be carved to obtain a sculptured effect, or it may be decorated by the aid of painting. But from this is to be rigidly excluded one expedient of the poverty of modern thought, though it always passes for a mode of increasing the beauty in spite of its ugliness, the chamfering of angles and the outlining of forms by a colored line. It is incomprehensible that this error in taste does not disappear, but in our schools it is even prized as a specimen of refined taste. The most pleasing form is afterwards weakened and ruined at an increased cost, and if it is to be made especially

beautiful, a bold red stripe is then drawn at a uniform distance from the ugly edge, so that the form possesses still less character. Is the architect then compelled to ape the wood carver, who alone possesses the right of enclosing his work by bands?

8. Paling walls.

Paling walls also include simple park fences consisting of vertical poles placed close together and supported by horizontal rails, and they present different modes of treatment. The fences mentioned possess means of obtaining the most diverse forms, in the careful selection of pickets of equal or alternately equal diameters, in the substitution of pleasingly interwoven willow twigs for the horizontal rails, in the simple carving of the upper ends of the verticals and in the partial removal of their bark. For park enclosures, poultry yards, fences in zoological gardens, etc., this simple motive admits of variation in many pleasing ways, and if the woodwork, whose principal color effect is due to the color of the bark and the wood of the denuded places, be heightened by the aid of interwoven work of brightly colored twigs, Indian red being used on portions of the poles, and the openings between verticals being filled with fine lattices, as may be required, from these simple elementary ideas may be developed an inexhaustible wealth of treatment of forms.

A peculiar use of paling work is found in Upper Austria and Steiermark in hay sheds and similar rural structures for ordinary purposes; the simple frame of such sheds is so filled in with slender fir poles as to make the spaces between posts, girts and plates appear striped (Fig. 77). these stripes are formed of the poles and the spaces between them and may be varied in many ways. This kind of a wall has recently been employed for rural structures and zoological gardens, etc. Ordinary lattice partitions are used in all kinds of buildings for ordinary purposes and are treated in many ways by means of cutting the edges of the strips. From the method of linear division of surfaces an inexhaustible number of motives may be obtained, which are evidently governed by the same limiting principles, that have already been given for the ornamental cutting of boards (Fig. 78).

From a higher point of view the forms of the strips may employ every expedient of carving, and may thereby be changed into works of low relief in wood carving proper; also the round pieces furnished by natural trunks may by the same expedient of carving be transformed into true sculptures in wood.

e. Paneling and lattices.

Paneling is always composed of a thicker framework with thinner panels; the frame forms a kind of network and the panels may be grooved in, fastened on as a lining, or may be entirely omitted. The material of the panels is usually wood, which may be replaced by marble slabs, plates of engraved or cast metal, sheets of glass, parchment or cloth, etc., according to the purpose served by the paneling. We now have to consider in detail the modes of forming the framework and construction of the panels, simple panels, materials of panels, treatment of joints, mouldings, etc., the various kinds of lattices, and lastly the purposes for which paneling and lattices are used.

Paneling is constructed of small pieces of wood by placing one series against the face of the other, by mortises and tenons, tongues and grooves, etc.; strictly speaking any net system may be employed for paneling, but preferably only a web system, some mosaic or lattice systems are made a basis of paneling. The essential requirement for the pieces of wood used in the framework is that they must be narrow, so as to shrink but little. Therefore they should be rather narrow than wide; the same is likewise true of all wooden panels, which shrink least the narrower they are. From this results a division of the framework into many combined elements; when the frame is to be made very broad with narrow panels, solid tongued and grooved mouldings must be placed between the frame and the panels (Figs. 79, 80).

The decoration of the framework itself must accord with the principles established for the bordering or enclosures of surfaces. It is usually moulded and decorated by inlaid or carved ornaments, and is also ornamented by metallic knobs placed at the intersections of the wooden pieces or by metallic trimmings.

The richest paneling is to be found in the joinery and cabinet work of the Arabs, and in that of the Renaissance.

If the panels each consist of several parts, they may be combined in accordance with any suitable mosaic system (Fig. 81); they then generally require to be strengthened by a second thickness of boards at right angles to the panel. The panel may also be composed of two thicknesses of elements, these in front covering the joints of those in rear (Fig. 82), a favorite motive in mediaeval work. Finally, the panels may be partly or entirely replaced by mouldings grooved in, or special rails and muntins may be inserted, the grooved-in mouldings being broken around between them (Fig. 83). The wooden doors and ceilings of the Italian Renaissance employed these motives in very varied ways. the use of grooved-in mouldings and special rails and muntins affords this advantage, that finer kinds of woods can be used, which are not of large dimensions, and that the paneling appears both rich and strong; on the other hand both labor and cost are increased.

Joinery of the present time employs less than it might, kinds of materials other than wood for panels in paneling. Wood is always necessarily used for panels, when these are subject to direct strain as in doors, wainscot and similar works, where they may be broken or pressed in. To increase the direct strength, its middle portion should be strengthened, either by the mediaeval vertically moulded and raised panels, stopped at their upper and lower ends by carvings of many forms, or by the Renaissance raised diamond paneled ashlar, but one must be as careful as possible to keep the forms of these diamond panels as distinct as possible from those employed in stone work.

To this use of the ordinary woods for panels may be added that of the precious woods, of intarsias and all kinds of inlaid work. One of the best materials for the panels not exposed to injury is smooth stone of fine color and polish, easily procured in many localities. Not only the different kinds of marble, but also the various kinds of quartz, serpentine, lapis lazuli and fluor spar, etc., also glass crystals and stained glass, can be employed as panels, with slabs of engraved slate, etched lithographic stones, or any other suitable natural or artificial minerals, true sculptures, reliefs, etc.

We may further use for panels plates in relief of cast, hammered or electro deposited metal, enameled plaques, etc., the

products of metal and art industries, faience and majolica, porcelain and glass, the latter being transparent, with decorations engraved or etched, stained, gilded or opaque glass in the form of mirrors; also parchment, stamped leather, silk, velvet, cloth, lace, gold brocade, embroidery and other textile materials, lastly paintings executed on canvas or other materials.

The parts of the frame are connected by joints at right, acute or obtuse angles, and are corners, across or intersecting pieces, and during the middle ages it was the rule to ornament the insets and mortised joints in some way (Fig. 85). This is especially true of common wooden doors, which were ornamented in the simplest way; these decorated joints, such as are found in mediaeval and Swiss houses are worthy of use at this time.

The treatment of joints between panels and framework results from the requirement that the panel shall not be loosely set in the framing, but so as to freely expand and contract without danger of cracking or warping; if the panels are made of ordinary wood as usually the case, and that readily shrinks, two conditions are established, that the woodwork must not be painted, since a line joint of a different color would become visible by the shrinkage of the panel, and that the joint must be covered so that expansion and contraction of the panel may not be visible. This may be done by moulding the edge of the framework and placing a round next the panel; or by fastening a round or moulding of wood or metal to the edge of the framework (Fig. 86). If the wood is merely left in its natural color, only being oiled or coated with transparent varnish, the joints will not be visible, and the rounds and mouldings will not be necessary. If it be desired to paint the woodwork, with a preference for unpainted mouldings and joints, only the surfaces of the framework and panels are painted, leaving the mouldings in the natural color of the wood.

The mouldings of the framework and panels are determined by the following considerations: they are struck with a plane, a great variety of forms being thus possible; if the paneling is employed in the interior of a building, and is therefore principally lighted by diffused light, a strong movement in the profiles is required, while a moderate one suffices for exteriors.

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The darker the woodwork and the more distant it is from the eye, the stronger must be the movement of the profiles; polished woods and shining paint, varnish and gilding, are suited by the weakest movement.

According to the view with which the framework is to be arranged, that the material may appear more prominent around the margin of the surface or recede from a nucleus, leaving the middle less prominent (compare *Tectonics*, p. 195, statements concerning limiting forms), with the other view that concavity is connected with the representation of attraction and convexity with that of repulsion, determine the profiles of the pieces forming the framework, in connection with the principles previously stated.

Not taking any special style or the ancient orders as a basis, but in accordance with the preceding views, the profiles of the framework and mouldings may be composed of simple forms of section, which must be employed by men under all conditions in which they are placed. These simple sections are (Fig. 37):- 1, chamfering the angles. 2, rounding off angles; 3, hollows; 4, combined rounds and hollows; 5, combined hollows and rounds; 6, rounds; 7, grooves; 8, combined rounds and coves.

Variations of these basal forms may occur in three ways; a, by a more or less strong curvature of the profile; b, in case of combined forms, one or the other or neither is most prominent; c, when the form is not only treated as a connected but also as a transitional form, as in case of a curvature varying from a circle. Fillets, grooves and small hollows, serve to separate the different members, at the same time being bands to connect them; the plain flat surfaces adjoining these members serve as a contrast to the mouldings.

If it is asked how the historical styles of architecture have actually treated these moulded members, the answer readily follows, that they could not invent them as ground forms or geometrical conceptions, and could not separate them from the associations with which those forms are connected. Thus they only had a choice of omitting the ground forms on one place or of concentrating them on another, as in ancient classic architecture where the cavetto and round were seldom used, or as in Gothic where most members were composed of these two forms.

They could vary these ground forms by making them more prominent in accordance with one of the three ways already mentioned, they might arrange the forms in different sequences, separating them more or less sharply by fillets and bands, or they could omit these divisions and allow the forms to directly adjoin each other. Finally, these ground forms may represent the ornamental forms derived from natural objects borne by the ground forms themselves; thus Grecian art formed the cymatium in accordance with the natural curvature of leaves with points recurved downward, with more elastic forms suited to the delicate marble; the Romans and the Renaissance masters, their successors, transformed these into the quarter round and cornice forms. To be unwilling to use the quarter round because it was unknown to Grecian art and was seldom employed in Gothic, or on the other hand to never use these so-called cornice forms, because Gothic employed the round and cavetto in their places, or to accept Greek forms without question, the cymatium and cornice, merely because they were so made by the Greeks, is a principle that leads most directly to nonsense, it is to eat with the fingers because the Greeks had no forks. Our acts must be based on something deeper, we must investigate why we do one thing and avoid another, and conversely what we do must be done with full knowledge and for good reasons, no matter whether these were authoratative in past times or not.

One of the most decisive reasons existing at the present time, which compels us this way or that, to do one thing and avoid another, is the question of cost. We are always restrained in the treatment by a thought of the cost, and seek to obtain the greatest effect by the simplest means. The Renaissance most fully developed paneling; we shall learn most from that in relation to the treatment of our own.

From the requirement of the effect of contrast it results, that profile forms must be alternated; where no alternation is found overloading is produced, which commences with duplication and produces the effect of monotony and poverty of thought, instead of richness. Such duplications should be considered only when they are desirable in exceptional cases for reasons of economy. For wooden mouldings these reasons entirely disappear; whether a cove or a quarter round is cut, the cost is approxi-

approximately the same. At most round and deeply sunk forms require more labor and are therefore to be avoided or limited to exceptional cases. The Gothic style employed hollows and rounds more than any other, and made very marked differences in the radii and sections of those curved forms to obtain effective contrasts.

The requirements of contrast and variety are fulfilled if a hollow follows a round or the reverse. Therefore in concavo-convex forms of section, the cymatium, a quarter round or round may follow the cavetto, but not another cavetto.

We must further consider which form of profile shall predominate, whether concave or convex, and which of these shall be chosen. Concave forms not only convey the impression of attraction but also that of change, since they are transitional forms; on the contrary convex forms express an energetic repulsion. The concavo-convex, like the cymatium, are intermediate between the two, the sharp contrast of convexity being softened or prepared for. The expression of the corona will be modified in accordance with the predominance of convexity.

The finest frameworks of the Italian Renaissance enclose the entire work by a border moulding, which assumes one or the other form according to circumstances; the pieces composing the framework remain flat or form a sunken ground (Fig. 88), or are decorated by intarsias, sculptured ornaments or designs like bands. The richest decoration is concentrated on the space between the border and the panel; this member is often composed of pieces and bordered on both sides by mouldings, is finished as diamond panels (Fig. 89) or are decorated by ornaments in bands. The panels are either left plain, are finished with raised diamond panels, or finally are adorned by beautiful sculptured rosettes.

The later Renaissance sometimes enclosed the panels with very strongly projecting forms of mouldings, causing an appearance as if the material drew itself away from the panel with great force.

In richer works of joinery the cornice was decorated by a cymatium with carved leaves after the antique, the astragal was changed to a pearl head and the cavetto was ornamented by sunken incisions. (See Redtenbacher's Joinery). There exists

no reason for omitting these antique leaf mouldings and pearl beads from our works.

Paneling is preferably used for doors, windows, shutters, wainscot, furniture, wooden ceiling and their partitions.

7. Lattices.

Paneling becomes a lattice if the panels are omitted, as already stated.

Ordinary lattices are either constructed by placing strips over each other or notching them together, or if the strips are very thin and flexible they are interwoven (Fig. 90). In the two first cases the intersections of the strips are fixed by nails, but fastening is unnecessary in the last case. The lattice may be completely enclosed in a frame, or be suspended as to end free, the strips may be horizontal and vertical (Fig. 91) or inclined; the last are to be regarded as lattice girders. Lattices constructed of strips laid across each other or halved together give opportunity for great variety of forms, if as explained in my *Tectonics* in relation to the linear division of surfaces, the separate strips have their edges cut out in accordance with any linear system (Fig. 92 a).

Moorish and early Italian architecture have shown a special preference for these lattices (Figs. 93, 94).

A second mode of decorating lattices originated in the middle ages and consists of cutting the edges of the strips at the openings alone. These cuts may form complete perforations (Fig. 95) or they may only be carved leaving to the openings their square shape (Fig. 96); this motive was much used during the entire middle ages for doors, in which the spaces were closed by a lining of boards, and even for paneling with panels of majolica plaques and tiles, also for the walls of gabled houses as at Beauvais. The Renaissance retained the same motive for the construction of doors like a church in Deventer. It is self evident that the strips end free if not enclosed by a frame, and the nails at the intersections may be transformed to metal knobs and rosettes. The rules already given are applicable to the frames.

A peculiar form of lattice was invented by oriental nations, first by the Chinese who employed bamboo stems; these lattices consist of separate round members tenoned together (Figs. 97, 98); they form knotty swellings at their joints that aid the

no reason for omitting these antique leaf mouldings and pearl beads from our works.

Paneling is preferably used for doors, windows, shutters, wainscot, furniture, wooden ceiling and their partitions.

7. Lattices.

Paneling becomes a lattice if the panels are omitted, as already stated.

Ordinary lattices are either constructed by placing strips over each other or notching them together, or if the strips are very thin and flexible they are interwoven (Fig. 90). In the two first cases the intersections of the strips are fixed by nails, but fastening is unnecessary in the last case. The lattice may be completely enclosed in a frame, or be suspended as to end free, the strips may be horizontal and vertical (Fig. 91) or inclined; the last are to be regarded as lattice girders. Lattices constructed of strips laid across each other or halved together give opportunity for great variety of forms, if as explained in my Tectonics in relation to the linear division of surfaces, the separate strips have their edges cut out in accordance with any linear system (Fig. 92 a).

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artistic effect. A transfer of this lattice to that formed of flat strips was also a favorite with oriental nations, and it gives rise to arrangements in the most varied forms according to the mode of intersection of the strips (Fig. 99), and to the way in which the knots of the bamboo are replaced by carvings of all forms, as in Arab and early Italian lattices to be described soon.

A further development of lattices was made by Arab nations by using pieces turned or carved from square pieces of wood, instead of bamboo stems or wooden strips, and which were connected by holes and pins (Fig. 100). (See Ebers' Egypt). The modes of connecting linear groups of forms treated in the Chapter of Tectonics devoted to lattice systems, which are endlessly varied, the web and many embroidery and mosaic systems, may be employed as a basis for lattices of this kind, which as already mentioned may be produced from with network with interwoven turned forms. A great many Arab lattices are based on a combination of chains with lattice and other systems; it is self evident that it is impossible to survey the entire domain of this mode of construction of lattices with its entire possibilities, but it is interesting that they may all be referred to a few simple principles.

New combinations for lattices can be made by making its principal lines a network of woodwork, the spaces then being reduced in size by ornaments of wire, wrought iron or decorations of cast metal.

The uses of lattices are preferably for light partitions and enclosures or to serve as supports like lattice girders. They are also excellent for garden pavilions and enclosures, poultry yards and similar purposes.

5. Half-Timber Work.

Half timbered work is a mode of constructing walls, though its form would class it with paneling, yet from its nature it properly belongs to wood construction, because its different elements play an entirely different part in construction. These elements are as follows:- on a sill (Figs. 101, 102) as a base are set posts c, these being connected by a plate b. This frame would not be a stable form unless the timbers a and b are stayed by the struts or braces d; the girts e stiffen their bracing

and further divide the half-timber work into smaller panels.

In our modern times it is customary to make this work as regular in form as possible, using only straight timbers and thereby sacrificing the advantage of variety in effect and obtaining scarcely any improvement in the more perfect and stronger construction, which remains approximately equal to timber work regularly arranged as in Fig. 101, or irregularly as in Fig. 102.

Half-timber work plays its most important part in the construction of trusses and then in the construction of timber girders of bridges.

The motives for the esthetic treatment of half-timber work result from the form and arrangement of the timbers, from the mode of their intersection, as well as from the mode of filling the interspaces.

The half-timbers may be arranged in various ways as we have seen, and a difference should be made by the use of regular or irregular panels and their braces and girts, according to whether the purpose be structural or ornamental. Pugin gives in his *Details of ancient Wooden Houses* the examples of half-timber work represented in Fig. 103, as existing in houses at Boulogne. An alternation of different arrangements of the panels will always have a more pleasing effect, than if they were all treated in exactly the same way. The most pleasing half-timber houses have been preserved in the peasant villages and small cities of those countries in which wooden construction has been preferred; they frequently exhibit very instructive details, and are evidence of a true art feeling in their builders. For example the houses of Switzerland and southern Bavaria, of the Tyrol, the wooden houses of Swabia, of the Rhine provinces, of Hesse, of France, those of Norway, England, etc.

The use of naturally or artificially curved timbers in wood construction, or those cut into curved forms, may be very ancient; these were unjustly discarded from half-timber work in our time. The middle ages, the wooden architecture of the Tyrol and upper Bavaria, as well as that of Switzerland, favored the use of this means of obtaining pleasing forms in their half-timber work.

A few examples of such forms are here added as illustrations

from the houses of Hessian peasants (Fig. 104).

If the faces of the timbers are to be decorated, the struts being subject to compression are to be decorated by incised or painted stripes lengthwise like supports, and their ornaments may end in volutes, but the girts being in tension are to be characterized by patterns like bands.

The intersections of the timbers can be decorated in the manner described for paneling, and which was common in mediaeval and Swiss wooden architecture (Fig. 104, right).

The spaces of half-timber work are either filled by a covering of boards, which is most pleasing if placed on the inside of the wall, or by unplastered brickwork, for which a purely ornamental bond is especially appropriate, or lastly by plastered masonry. This plastering may then be ornamented in any of the ways already mentioned in the Chapter on its use, such as by incised sketches, sgraffito, ornaments in relief, or paintings. Half-timber work of special elegance is filled by tiles or terra cotta plaques.

In addition to a consideration of the structure of walls, we still have to mention covering the walls with slates, shingles, tiles, etc.

The mosaic system is the basis of all these modes of covering walls, and manifold motives may be derived from the linear division of surfaces with congruent elements as in Fig. 105,.

E. CEILINGS.

1. Non-vaulted stone ceilings.

The ideal of ancient architecture was the construction of stone ceilings with beams and slabs of stone, but it has lost nearly all practical value for our time. But the stone beam ceilings have retained a symbolical value for us. If we place ourselves on a purely material standpoint, and recognize or mentally perceive only what serves a material purpose, if we strip away every historical reminiscence and allow no custom or usage of past times to be correct, we should then throw the stone beam ceiling into the historical lumber room, for we may attain the desired end better and more cheaply by means of vaults or by iron construction.

But if we place ourselves on the general point of mankind, where we must know how correctly to distinguish between what

has but a temporary historical justification and what has a permanent value for all time, we shall find that in spite of differences of race, language and people, mankind is not only a unit in its mode of thought, but has symbolically retained remembrances of modes of life lying far behind us, and employs them on special occasions as in memorial ceremonies or monuments. In Tectonics in explaining the relations of form and purpose, we carried this thought farther and illustrated it by a few pertinent examples. We shall here call attention to the fact that objects become purely symbolical, when their original purpose no longer exists, as in the case of the hammer and trowel in laying corner stones, a ship used as a table ornament or gift of honor; that uses become symbolical, like the production of fire by rubbing together pieces of hard and soft wood in the ceremonies of nations, that have long made use of flint, steel and tinder.

We therefore still have a right to employ stone ceilings for ideal purposes, even if we could attain the end more economically by other means, and could cover the area by vaults, especially in case of tombs, mausoleums, churches and art museums; it is self evident that such use of stone beams is only possible when permitted by the narrowness of the roogs. But a second principle naturally follows, recognized in Tectonics in the true sense of the word, that stone beam ceilings must not be imitated in wood or other material, when the use of stone becomes impossible for static or pecuniary reasons. A false or bad symbolism like that introduced by the Neo-Grecians and never used by an artistically sound people consists in the external imitation of a thing, but a true symbolism can only result from the repeated use of similar means under similarly limiting conditions. If we can use granite with a resistance to fracture greater than that of marble, wider rooms may be covered by stone ceilings, than those found in the monuments of classic antiquity; if we place light plates of glass or metal on these beams instead of heavy stone slabs, we shall be enabled to cover still wider spans. If a ceiling is constructed of wooden or iron beams, the spaces of the ceiling would not be filled by slabs of marble. Briefly we can take scarcely any course leading us in a rational and free manner to forms,

suitable for stone ceilings different from that pursued by the ancients.

If we now place ourselves on a purely material standpoint, the motive employed in the construction of stone ceilings may be derived from the problem itself. If the space between two stone beams or two walls is to be covered, the method first suggested is to cover it with a single stone (Fig. 106). To shed rain water we incline its top toward two or four sides, and since it is less easily broken when its weight is reduced, we may hollow out its under surface. The largest ceiling stone ever yet employed is that of the tomb of Theodoric at Ravenna, which has the form of a low dome about 32.8 ft. diameter.

If the span between the two supports, whether stone beams, walls or rocks, is too great to be covered by a single stone, it is simplest to place several stones side by side (Fig. 107). The grandest use made of this simple structural principle is in the bridge of Loyang in China, which crosses an arm of the sea by 300 openings, each being about 46 ft. wide in the clear; 7 beams of black marble are laid from each pier to the next, and on the ends of each pier are placed marble monsters, those at one side resembling lions.

The problem may be solved in another way according to whether the abutments are stable or not. If they are, the simplest mode is to place two stones against each other or to arrange them in an arched form (Fig. 108), with the condition that they must not slip on the abutments. In general we may designate these and similar modes of constructing ceilings employed by Egyptians, Etruscans and Assyrians, as preclassical structural methods. To these is allied the widely employed principle of corbelling used in structures, whose supports are unable to resist a thrust. Beams of stone are laid so as to project beyond each other in an inverted pyramidal form, the span being thus reduced until the opening at top can be covered by a single stone (Fig. 109).

This principle from the earliest times to the present day was restricted to all ceilings of stone where an increased height was permissible; its highest development occurred in the the stone broach spires of the Romanesque and Gothic styles.

The simplest form of corbelling is produced by a single pro-

projecting course on which is laid a covering slab (Fig. 110); in case of covering wider spans or a greater height of ceiling several such courses become necessary, projecting more in the first and less in the second case. The corbels may be formed in a great variety of ways, either by partly or entirely beveling them as in Fig. 110, or they may be shaped as supporting parts with convex profile forms occupying more space, with transitional concave forms, or be decorated by cymatiums and rounds (Fig. 111). The architecture of different nations employed in these corbelled ceilings, sometimes simple beveled corbels, sometimes one or the other profile form, or sometimes a combination of members. According to the purpose and the problem, one may also employ these simple decorative expedients at this time, provided that all the forms are generally acceptable, and are such as result from the problem itself, none merely belonging to any special style. It is senseless to refuse to use them merely because any architectural style first employed or extensively used them.

Corbels (Fig. 112) as separate bearers, employed as modillions in classic architecture, or in the middle ages as supports for the most varied purposes, are nothing else than such a mode of constructing ceilings in another form; for if the ceiling itself only slightly preponderates in comparison with its mode of support, or if it assumes any form, the principle remains the same.

From the need of reducing the height of the stone beam ceiling constructed by corbelling, the classic coffered ceiling takes its rise. The architrave is the principal support of the ceiling and extends along the walls and above the columns, usually composed of two deep beams set side by side, one outer beam passing the other at the angle, which abuts against it, while the two inner beams are mitred together (Fig. 113). The stone beams form a great paneling showing large openings on its plan, and these may be covered by any methods previously mentioned. The classic coffered ceiling (Fig. 114) divides these large openings into smaller ones by a series of beams A A, and into a second series of still smaller panels by a second series B B of still smaller beams, then covering the spaces by a number of stone slabs, excavated in the form of coffers

to lessen their weight. The beams A and B together have a certain depth that corresponds to that of the height of the geison or projecting part of the cornice (Figs. 114, 115), and it is so arranged that this is supported by B and also rests on the architrave, either as in the Doric style by a series of low pillars, the so-called triglyphs whose intervals are filled by the stone slabs of the metopes, or in the Ionic and Corinthian orders on the stone beam of the frieze. In the Ionic style the intervals between the beams are sometimes materially reduced by corbelling out the beams A and B, a third series of beams C sometimes being inserted, upon which are then laid the coffers.

So far as our knowledge of ancient architecture extends, we cannot assert that the ceiling of stone slabs was developed in its full extent. There are still possible solutions of the problem not employed in the classic styles, or at least no examples of them have remained to us. It is first to be considered that larger interspaces between the stone beams may be covered by stone slabs laid against each other instead of coffers (Fig. 117); The slight thrust exerted by such panels may be entirely neutralized by anchors of metal. Further the principle of corbelling may be employed in a more extended way than in the classic styles, and finally it is not necessary to make the coffers themselves square, but they might as well be hexagonal or octagonal, when stones of suitable form are placed to support them (Fig. 118).

If the principle be consistently executed, that the construction should supply the leading ideas for the architectural treatment, one may then use the classic beam construction at the present time with perfect impunity, the Ionic frieze as well as the Doric triglyphs and metopes; but for the same reason, one should not regard the triglyphs as being purely ornamental expedients like the Roman and Renaissance masters, and retain them when the frieze is composed of continuous blocks. The triglyphs are and remain supports, although perhaps originally used in another sense, the metopes are panels, and neither has any justification for its existence if it supports nothing or fills no interspace.

To declare the architrave unnecessary, when it does not span

the intercolumniations of columns or pillars but rests on continuous walls, like most of the Gothicists and the Rigorists for false Tectonic aims is no less a mistake, which could only proceed from the erroneous idea, that the wall is to be regarded merely as a space enclosing member, but not a supporting one also. When the wall acts as a support, it must be regarded as a kind of extended pillar. The masonry, even when most perfect, requires a leveling course to support the parts that commence above it, and the architrave is very justly regarded as acting as such a leveling course when it does not span openings. But since this would have triglyphs with greater propriety than the free spanning architrave, whose middle should be as lightly loaded as possible, the latter should be constructed in accordance with the principle of reducing the weight, as in the temple of Jupiter Stator at Rome (Fig. 119).

That the classic styles employed the principle of corbelling in the construction of the richer forms of ceilings is proved by a beautiful example, the tomb at Mylassa. The motive of this ceiling (Figs. 120, 121) exhibits a rich alternation of different forms of stone beams and coffers.

If we now inquire concerning the esthetic treatment of all these constructions, we shall scarcely attain any result other than that reached by the classic styles and accepted by the Renaissance; On the one hand that the beams are always bearers, on the other that they connect the supports with each other and with the wall. To increase their direct strength, their depth should exceed their width. Their lower surfaces are appropriately ornamented by band patterns and imitations of twisted ropes that express connection; supporting moulded members are suitable for their upper edges as in the classic method, which are decorated by leaf patterns and pearl beads.

Their mouldings will have different profiles according to their materials and the mode of lighting, the light almost entirely coming from beneath in case of ceilings, through windows and as reflections from the floor in case the coffers are not made of glass.

The following distinctions concerning the forms of ceilings are to be considered.

If the moulding and beam form a single piece, much material must usually be cut away from the rough block. Hence in the

construction of ceilings on a very large scale, it is preferable to insert the mouldings as separate pieces in the beams as at a (Fig. 122). If the principle of corbelling is to be utilized as much as possible, we should let the moulding predominate as at b (Fig. 122), subordinating the vertical surfaces; according to the end proposed, the profile will itself be varied, either choosing the energetic convex form, or the softer concave transition form in case of lighter constructions. If the stone beams are all properly anchored together, or their ends are built into loaded masonry, when the architrave should not be too heavily loaded, and when the span is small and deep architraves of strong stone are used, a strong projection of the corbellings is permissible; it is then best to mould the entire surface of the corbelled beams, since their centres of gravity are then removed farther back from their faces as at a (Fig. 123), while with the arrangement b, the projection of the overhanging part of the beam makes it possible for it to tip over. If the beam a (Fig. 124) is so long that it has a firm support at each end, it evidently may be corbelled out considerably; but the intermediate beams b, which complete the framework, must then either be corbelled out but little, or they must be supported by the ends of the beams a a by means of inclined joints. This horizontal lower surface of these beams may also be decorated by patterns like bands.

In mediaeval stone beam ceilings, the angles of the beams a are generally moulded by coves and rounds (Fig. 125). Scarcely can anything be urged against this practice, yet one should adhere to this rule, that all approximations toward mediaeval forms should be avoided, the further the work is removed from the construction of churches, but these forms become permissible in the ratio on which the work approaches that purpose. A Renaissance like that desired by us and which will satisfy all requirements of our time, may very properly approach more or less closely to one or the other style tendency, or even the styles of foreign nations according to its needs, without losing its internal unity so long as it adheres to a principle that is generally applicable; but this principle must be that nothing is imitated, but that the form treatment is developed from the thing itself, and with this thing are always connected

the purpose and the material, the construction, the external requirements of life and the local conditions. But we shall return to our theory of form after these general considerations.

The vertical side surfaces of the stone beams are not usually decorated; yet they might be ornamented by a so-called fret, the well known Grecian band ornament, or by a band of palm ornaments.

The coffers themselves are stone slabs hollowed for sake of greater lightness, and were treated in the classical styles as if transparent, just as if the starry sky was seen through them, and they were therefore decorated by golden stars on a ground colored blue or red. At a later date the stars were changed to rosettes in relief.

These ornamental expedients for the treatment of stone ceilings have a claim to be employed again when stone ceilings are used, by being both pleasing and characteristic as well as a venerable form motive consecrated by tradition.

If it is desired to close the interspaces by several slabs joined together, rather than by coffers (Fig. 126), they should be made lighter by being hollowed, the joints being concealed by rounds or pearl beads, the whole being crowned by a decorated keystone. The coffer might also be wrought from a thick block instead of a thin slab, and be lightened by being hollowed and by removal of the superfluous stone on its exterior, and decorated by a suspended flower (Fig. 127).

2. The ceiling of Wooden Beams.

The simplest form of wooden beam ceiling is that composed of a series of beams on which is laid a covering of boards (Fig. 128), this floor may be for walking on or it may be loaded, and in the last case the beams must be so strong and placed so near together, that they can support the load. If the span is too great for the beams to support the load without bending, they are supported by girders at their centres, or by several at suitable distances (Fig. 129). These girders may in turn be supported by trussed beams and by vertical posts as shown in Fig. 130, where several different forms of trussed beams are collected in a single figure, employed in the construction of mediaeval ceilings in Tübingen and its vicinity. In Figs. 131, 132 and 133 are shown further examples of similar modes of

supporting beams by cap pieces from the town halls of Freiberg, Meissen, and the Germanic Museum at Nuremberg. The bead ceilings may be so constructed as to have intermediate beams (Fig. 134), and the main beams may be doubled or trebled instead of being supported by girders, so as to support the load, further the board floor may not be visible from beneath, the interspaces being filled by separate panels of boards.

It is now easy to derive from the structural idea the motive which supplies the decoration.

We first have to consider the beams and their supports, their bottom and side surfaces; we shall then speak of their connections with girders, caps, trussed beams, the intermediate beams, doubled and trebled beams, lastly of the board panels, their joints and border mouldings, and the grooved-in panels.

If the ceilings are not supported but are suspended from the roof construction, the suspension members and rods, the trussing of the beams by iron, should all be mentioned. From the motive of the suspended ceiling may be derived peculiar forms, like those favorites during the middle ages and taking the form of vaults, although constructed of timbers. In all wooden structures the supports of the ends of beams are of great importance, for if the ends of the beams decay, the ceiling falls.

These end supports of the beams vary according to the purpose of the timber work and its arrangement; either the ends of the beams form wood corbellings in wooden and half-timber walls, which support the upper stories (Fig. 135 a), or their ends are flush with the external surface (Fig. 135 b), or they rest on a wall plate or girt like the beams of a wooden roof (Fig. 135 c), their ends are built into the wall (Fig. 135 d), or tenoned into a wall beam according to a French method (Fig. 135 e), or laid on a brick corbelled cornice (Fig. 135 f), or a wall plate is inserted between the beams and the cornice (Fig. 135 g), or corbels are used instead of a cornice (Fig. 135 h); with posts placed between the corbels and wall plate in many cases with or without brackets, or finally the wall plate rests on a projection of the wall.

In all cases where the end support of the beam forms an offset, so that an interval exists between the support and the board floor, this may be filled with a vertical board or by

one inclined forward (Fig. 135 i); if this board may be decorated by perforations, and the joints between it and the board floor be concealed by moulded strips. The wall plates may be moulded, decorated by stripes lengthwise or be left smooth.

The most pleasing forms of end supports are derived from the motives f, g and h when the cornices of stone or brick are of rich forms or by the development of the corbels. Very rich methods of constructing these end supports were devised in the middle ages and during the Renaissance in numerous massive wooden ceilings of Dutch churches, town halls and castle halls, etc.; their principle is to lessen the spans of the beams by beams of long caps. A corbel a (Fig. 136) supports a strut b on which rest two caps c and d, which support the beam e. The cap c is supported by a brace i, a wall beam by the braces h,, and this wall beam serves to receive the board floor laid on the beams f. The corbels are shaped like classic consoles, or are decorated by shields, heads or figure sculptures, the caps may be characterized in the most varied ways, as being both free ending and supporting members, for which the volute curve derived from the Ionic capital supplies a suitable motive; the struts are generally cut from crooked timbers and are curved in various ways; finally, the struts and beams are moulded or decorated otherwise; massive pins with carved heads in suitable locations increase the pleasing appearance of such ceilings.

An example of a beautifully carved cap is given in Fig. 137, from Burghausen near Oetting in Bavaria.

The intervals between the beams e and f may be filled with perforated, carved or smooth boards.

The lower surfaces of the beams are appropriately decorated by band patterns of carving or painting, and the side surfaces by frets, bands of palm ornaments, etc., borrowed from stone beam ceilings. But the most suitable mode is to mould the angles and surfaces of the beams. Since these mouldings are produced by a plane, they either extend the entire length or terminate at the middle and ends against special carved ornaments. a fine example of this kind is shown in a curved beam ceiling of low rise in Zurich (Fig. 138).

Girders are to be treated like the beams. For trussed beams, four examples are given from in and around Tübingen, the form

of an elastic spring may be generally recommended, as seen in the bow and crossbow and in the related form of the Ionic capital, a form whose nature and function fully correspond to that of the trussed girder.

In case of the intermediate beams we are governed by the thought, that as these are less heavily loaded than the main beams, they should express the character of this loading. The ground idea of the moulded beam, whether main or intermediate, is always that of a bundle of pieces bound together and resisting the flexure of the beam; rounds, coves, fillets and grooves as well as chamfers, alternate with each other in rich variety. In this way are produced the mouldings of double or triple beams by the combination of the half sections of the separate beams of the different layers. Figs. 139, 140, give examples of beam ceilings and sections of beams from castle Chillon. Figs. 141, 142 are from the castle of Meissen; fig. 143 is from castle Schaefenburg near Dresden; Fig. 144 from the Nicolai chapel in Dippoldiswalde near Dresden, the two last being in the Renaissance style.

The rules already given for similar cases apply to the board panels, the joints may be matched or rebated and beaded, so that no apparent crack results from shrinkage of the boards. the joints may also be covered by battens fastened to the boards at one edge only, so that the adjacent board may freely expand and contract.

The inserted panels should be enclosed by mouldings and may be left plain, carved or perforated. It is easy to see that by partial painting and gilding, the effect of such ceilings may be materially heightened, and in case of necessity a pleasing effect can be obtained by the colors white, black, yellow ochre and Indian red. But it should be considered that in ceilings with moulded beams, similar members must have the same color, that gold should only be used for fine lines, and that the members should be sharply separated by narrow fillets and grooves, etc., so that the colors may be used on spaces that are moderately lighted. The farther the ceiling is from the eye of the observer and the less strongly the room is lighted, the brighter must be the colors, so as to have a good general effect. On the same grounds the painting of objects in gay and bright col-

colors may be censured as in case of the furniture of churches, etc., viewed from a small distance, as an error of taste, that has become quite fashionable with many architects during a very recent period.

Different decorative forms result from the construction of suspended ceilings where the points of intersection of the beams require special consideration. If the suspension members are iron rods with screw ends on which nuts are placed, a washer must be inserted between the nut and beam. This washer may take the form of a rich iron ornament, or may be replaced by several disks of metal placed on each other, or by suspended ornaments like chandeliers. The latter are particularly appropriate when chandeliers are to be suspended from the points of intersection.

We have already stated that turned constructions may be used to divide the ceiling into vault-like portions; the suspension rods then terminate in drops or knobs, the ceiling may be composed of groined vaults with ribs and cross arches, on which is placed the covering of boards, and the apexes are ornamented by carved wooden bosses at which the ribs intersect each other. In Belgium and Holland, very graceful wooden ceilings of this kind were erected until the Renaissance period, for example in Harlem (Fig. 145) the coverings were made of boards bent by steaming, and the richest late Gothic vaulted constructions were imitated, but treated in a manner perfectly corresponding to wooden construction.

This structural principle transferred to horizontal roof trusses leads to tunnel vaulted ceilings (Fig. 146), which were very frequently employed in Dutch buildings, and were either covered with boards, or as may be natural to a people engaged in shipbuilding, were treated like ship-framed ceilings in the form of groined vaults, and if all the timbers are suitably moulded posts, braces, and free-ending posts are properly carved, these ceilings are very pleasing. The horizontal beams that support the entire construction were decorated by painting, and in churches were generally utilized to form a passage, so that one could walk the entire length of the church along the lower part of the ceiling.

We have strayed into the domain of visible trusses and will now return to our starting point.

Beam ceilings should also be mentioned here, where the interspaces are not covered by boards but by tiles. It is easily seen that this mode of constructing ceilings, hitherto only employed for stables, is capable of esthetic development, and may also be used for other purposes; the same is true of ceilings composed of wooden beams set diagonally, between which are turned brick arches. Instead of tiles might be employed slabs of stone, cement, slate, glass, etc., according to the purpose for which the ceiling is constructed. Board ceilings are wooden beam ceilings covered by boards on the underside. The expedients for their decoration consist of painting and in covering their joints by moulded battens, a division into a few large panels, each of which is enclosed by partly perforated and partly carved boards, as in a very pleasing church ceiling at Zug in Switzerland.

3. Paneled Ceilings.

Many of the wooden beam ceilings just described might also be termed paneled ceilings; but true paneled ceilings introduced by the Renaissance commenced as imitations of the classic coffered ceilings, but developed into forms quite different from those of beam ceilings. They are composed of intersecting beams, either having all the beams of large ceilings halved together at the intersections, which are also strengthened by bolts or keys, some of the beams extending from one side to the other, the remaining beams abutting against these or being tenoned into them.

Since wooden beams of great length may be obtained, the web system may be employed as a basis for coffered ceilings. In his Five Books of Architecture, Serlio gives a beautiful coffered ceiling produced by the intersection of lines making 60° with each other.

Larger coffered ceilings appear somewhat monotonous, the Renaissance masters sought to avoid this monotony by replacing a group of coffers by a larger panel; these panels might be square, oblong or cross-shaped.

New motives for ceilings are produced by dividing the large panels into smaller ones by means of smaller beams, further by changing square into octagonal panels, by cutting off right angled triangles and thereby strengthening the corners, or into

cross-shaped panels by small beams placed at right angles, lastly by producing the ends of the smaller beams beyond the intersections with the larger beams. Compare the motives shown in Fig. 147.

A further improvement in this mode of constructing ceilings can be obtained by means of small beams set diagonally (Fig. 148), by tenoning the ends of small beams into the frames of separate panels b, and by the introduction of circular frames or of those cut to other curvatures. Further, these ceilings may be decorated by using beams that do not intersect but are merely tenoned together (Fig. 149). With these expedients we can obtain an inexhaustible variety of possible arrangements of ceilings, all derived from the simple coffered ceiling.

Many of the constructions are not to be considered as being very strong; if it is desirable to employ such, their pleasing appearance making them desirable in spite of their lack of strength, a series of beams is laid above the ceiling, to which it is fastened by bolts. This series of beams should be regarded as a web system, whose intersections can be arranged in various ways. At these points the paneled ceiling is to be bolted to the beams, and they may be decorated in the most diverse ways by knobs, rosettes, etc.. The motives for these paneled ceilings with an upper layer of beams to which they are fastened, are finished by web, embroidery, mosaic, lattice, chain and net systems. All division of surfaces exclusively consisting of curved forms may thus be used for paneled ceilings. As in beam ceilings, we may use large and small beams in paneled ceilings also.

The motives employed in the decoration of paneled ceilings are essentially similar to those used in paneling, stone and wooden beam ceilings. If what was said in the Chapter on that topic is recalled, we can easily establish fixed principles for the decoration of paneled ceilings, but it must not be forgotten that like all other forms of wooden ceilings, these must possess a peculiar character corresponding to the material, and that ornamentation by wood carving, gilding and color are especially appropriate.

It is self evident that lighter horizontal lattices may be bolted to beam ceilings, whose interspaces may be filled with

boards, producing boarded or battened ceilings subject to the same rules as lattices. Several very beautiful ceilings of the Italian Renaissance churches have turned this motive to good account. (See Celings from Verona in Semper's *Der Styl*).

3. Iron Ceilings.

Iron ceilings are partly used on account of safety from fire, partly because by the aid of this material the widest rooms may be covered with maximum economy of material and expense.

Besides iron, only stone and brick are employed for fireproof ceilings, wood being also used in those not fireproof. In general iron ceilings are constructed of iron beams or girders, supported by heavy trusses for wider spans. What is to be said of the construction of girders will be given in treating of beams and of iron construction in connection with other things. It will here only be said in a general way, that cast and wrought iron girders require simple forms, and that the lattice assumes special forms with the least propriety; further that forms of uniform strength are approximately employed for iron construction; finally, that painting with oil colors is required to protect the iron from rust, and that with this help the pleasing effect of iron construction may be materially enhanced.

Iron ceilings are preferably used for buildings intended only for ordinary purposes, therefore a minimum of artistic treatment is usually sufficient, if the entire arrangement is a pleasing one; the pleasing effect increases with the simplicity and clearness of the construction. Further in iron construction, the magnitudes seen by the eye are small in proportion to the wide rooms that are covered; the external appearance of iron construction depends less on the forms of the individual structural elements, than on the mode of connection and their arrangement.

In iron ceilings not too far removed from the eyes of the observer, the iron beams should be ornamented by elegant mouldings or by perforated ornaments made of cast iron; but wrought iron beams made of rolled plates riveted together can have scarcely any form other than that absolutely required for their purpose.

If the interspaces between the beams are vaulted, the same rules apply that are given in the Chapter on vaults; if filled

by slabs of stone or wooden boards, their panels are to be treated like those of stone or wooden ceilings. If glass be used for this purpose it can be decorated by etching or engraving, or true glass staining may be employed.

4. Visible trussed Roofs of Iron and Wood.

Visible trussed roofs are ceilings supported by a combined and mutually strained system of connected members. These consist in general of horizontal ties and tierods, lastly of horizontal tiebeams connecting the end joints. If the supporting members are placed above the ceiling, this becomes a suspended beam, coffered or paneled ceiling, and the principles stated in the Chapter on those forms of ceilings are applicable. The roof covering of visible trussed wooden roofs is not supported by beams but by rafters, and these may directly support the roof, or purlins may be interposed between the roof and the principal rafters; the rafters are usually straight, but are rarely curved as in spires of the Barocco period. The supporting system of combinations of rafters is termed trusses.

α. Wooden trussed roofs.

For the covering of these roofs the form motives result from the ideas already given for the treatment of ceilings. The covering material of stone, tiles, glass, slates, wood, straw, metal, etc., is usually fastened to a series of wooden battens, which may generally be decorated like other strips or bands according to their nature and purpose, if the covering material remains visible beneath, like all panels in interspaces. The supporting rafters, whether straight or curved, on account of their small resistance to bending should have greater depth than width like all other beams, and should be treated like beams. When opportunity offers, the principles determined for limiting forms determine the forms of tierods, struts and other connected parts. (See Tectonics, p. 195 et seq.). If the rafters or the main beams supporting the purlins are composed of curved pieces, they may be decorated by carvings according to circumstances, like those considered in various parts of our Tectonics and Architectonics.

As purely decorative expedients in visible trussed roofs, we may employ for filling interspaces between the structural members, perforated or solid panels of all kinds, also carving, painting and gilding on suitable prominent parts of the struc-

structure, metallic ornaments, etc.

A simple and clear construction is always the most important thing in all visible trussed roofs, whether of wood or of iron; abrupt transitions in the direction of different intersecting structural parts may be softened by transition curves in rare cases, almost entirely limited to massive roof and bridge constructions of rolled plates; it more than necessary to avoid such interventions, opposed to the rigid system of massive structures when construction and energy of effect for esthetic reasons neither require nor allow any softening or weakening by paltry trifles. Only in case of rafters of many trusses of wide span intersecting at oblique angles, is it often proper to insert large transition curves, which lend a bold sweep to such roof constructions; when such structures are used as in many roofs of railway stations, or in wide aisles of churches, halls, buildings for circuses, etc., are they entirely correct.

β. Visible trussed roofs of Iron.

The treatment of iron trussed roofs is similar in principle to that of those constructed of wood; according to what has already been stated, the difference in treatment of the separate parts results from the essential difference of the two kinds of materials, and the technical processes dependent on these. Economy of material and of weight, as well as the greater strength of iron members of equal section, compared with those of any other material, gives to iron construction a lighter character throughout than that of other constructions. The peculiarities of the modes of connecting the different parts, mostly joined by rivets, screws, bolts and keys, obstructs a free movement in the artistic form of iron trussed roofs, a freer play being almost entirely restricted to the parts composed of cast iron. Yet whatever is lost in richness of form by the rigidity and thinness of the iron construction, as well as by the difficulty of working the material, can be compensated in some degree by the aid of plates of cast iron perforated or decorated in relief, by decorations in thin metal, by ornamental details in wrought iron, which are considered in the Chapter of Tectonics on Locksmith's Work, and lastly by painting in oil colors required as a protection from rust, and by gilding; further, since iron construction is never required to possess the

predominant monumental character of stone structures but always serves a purpose more or less temporary, a moderate use of zinc is not excluded, being an auxiliary material par excellence of our era.

5. Vaults.

The vaults preferably employed in architecture may be arranged in three classes, of which a brief description is advisable in the following pages for many reasons:- a, classic vaults; b, mediaeval vaults; c, Renaissance vaults.

Among classic or ancient vaults are to be mentioned tunnel vaults, domes, groined vaults without ribs and produced by the intersection of tunnel vaults. The name of mediaeval vault is applied to all construction of ribbed vaults derived from classic forms. We term Renaissance vaults all modern forms of vaults existing since the beginning of the Renaissance era, which were unknown to either the classic perior or the middle ages, welsh-groined vaults with or without intersections by tunnel vaults, the conical vaults of curved outline, only connected with ribbed vaults during the middle ages, etc.

We shall treat here neither of the historical development of the vault, not describe all the structural peculiarities of vaulted construction, which would be necessary in a treatise on mediaeval architecture or building construction, in order to understand the matter, and therefore touch but slightly on the historical as heretofore, and on the structural only as far as may be necessary for the derivation of the ornamental treatment of the vault.

a. Antique Vaults.

Roman vaults are well known to have been either built of stone voussoirs or of hollow pots stuck in each other, or lastly of separate principal arches connected by intermediate arches, the intermediate spaces between these two kinds of arches being filled by concrete. In most cases the surfaces of the v vaults were coated by plastering, since the excellent bricks and cement made uncoated stone vaults entirely unnecessary, or limited them to the smaller structures.

i. Tunnel Vaults.

If a series of arches are placed side by side the simplest form of the tunnel vault is produced; if the voussoirs are of

stone, the motive of hollowing on their inner surface results from the requirement that the stones must be as light as possible, to lessen the horizontal thrust of the vault. This hollowing best corresponds in every relation to the formation of a rosette strongly raised from the sunken ground, and thus a sort of coffered ceiling is produced by the vault in the simplest way, entirely independent from the horizontal stone ceiling.

The idea of the tunnel vault with coffers being once accepted, a slight consideration leads to a further advance, the end joints of the voussoirs appear too prominently on the inner surface of the vault; they are concealed by decorating them by sunken mouldings or by pearl beads. But the vault may be more tastefully constructed of supporting arches, each being stable of itself, preventing the arches from yielding sidewise by longitudinal connections, moulded like the arches or otherwise, then filling the interspaces between the two systems of arches by separate stone slabs, fitted in place. Thus are produced coffered vaults, similar in external appearance and allied in principle to coffered ceilings, because the supporting parts form a complete system by themselves, and only thin slabs of stone are required for filling the interspaces. Perhaps the most beautiful coffered vault constructed according to this principle, though in a somewhat developed form, is that of the sacristy of S. Spirito in Florence, a noble specimen of early Renaissance. A second very pleasing example is represented by Viollet-le-Duc, p. 125 of *Dictionnaire Raisonné d'Architecture*. The intersections of the transverse arches and the longitudinal members are distinguished by decorated keystones.

If the voussoirs are small and of soft material like volcanic tufa, or are artificially prepared like bricks, they may be shaped in accordance with web embroidery or mosaic systems, which indeed has only been done in exceptional occasions, and preferably for decorative purposes. For example, Strack employed vaults of this kind in the graceful vestibules of Eörsig's Machine Shops in Berlin. For plastic clay, the under surface of such ornamental voussoirs may be ornamented by pressing in moulds; soft materials like tufa may have carved, sunken or raised forms.

Semicircular and pointed tunnel vaults, when built of brick,

if half brick thick are entirely composed of stretchers parallel to the axis of the vault, while Dutch bond is used for thicker vaults.

Such vaults are most simply decorated by borders and by making their upper portion most prominent by means of colored bricks, also by the use of decorative patterns of bonds, which may be employed in tunnel vaults of low rise, are most tasteful if vaulted parallel to their diagonals like Fig. 150 a, b. The middle of the vault is then marked by the intersections of the bricks, and a decoration of the construction by means of colored bricks is appropriate to the middle and edges of the vault.

If long rooms are covered by tunnel vaults, these tunnel vaults are divided into bays by transverse projecting arches, partly to break the monotony of the vault and to obtain a greater variety in unity, and partly to make the vault lighter. The forms of these transverse arches will be considered, when we treat of mediaeval vaults in connection with other things.

A mode of constructing tunnel vaults by a series of strong brick arches connected together by longitudinal arches, the interspaces being then filled with concrete, a method of constructing vaults known to have been frequently employed by the Romans, fully explained by Viollet-le-Duc leads again to the coffered vault. (Dict. Rais. IX, p. 485 et seq).

β. Roman groined vaults.

Groined vaults of the Roman system produced by the intersection of two tunnel vaults, the diagonal arches not projecting beyond their surfaces as groin ribs, are to be treated like tunnel vaults. If the vaults are of stone, since the curves of intersection of semicircular equal tunnel vaults are elleptical, the separate stones of the diagonals must have peculiar forms, and each stone must be determined separately, so that the tunnel vaults may unite in a good bond. Since the tunnel vaults rest on these diagonal arches by means of the indentations of the bond and heavily load them, they must either have a depth greater than that of the vault, or be constructed of a stronger material than that of the vault, so as not to be crushed under the load. This strengthening of the diagonal arches then expresses the greater importance of these over the surfaces of

the walls themselves, either by a material of a different color, by a special mode of decoration, or by a greater prominence of the lines of intersection of the vaults in the form of ribs, wrought on the stones of the diagonal arches to strengthen them.

The inconvenience of determining and working these diagonal stones with their complicated joints naturally leads to the idea of strengthening the diagonals by constructing the diagonal ribs as if standing independently, then letting the surfaces of the vaults intersect above the back of the ribs.

The plan of a Roman tunnel vault with longitudinal and transverse arches but without special projecting ribs was formed as at Fig. 151 a; that of a vault with diagonal ribs as at Fig. 152, b, in case that care had previously been taken to provide a complete support for all the arches of the vault by arranging supporting piers in the plan. But in case not only the latter were required, but the cutting of the springing joints of the arches was to be simplified, as well as to obtain a perfectly free development of all the separate arches of the vault, the piers c (Fig. 152) required the addition of a projecting member in the direction of the diagonals.

Thus the ribbed vault was developed from the construction of the Roman groined vault in accordance with the requirements of expediency; if the ribs are to be entirely omitted and the vault is so well built or its loading is relatively so small, that they can be omitted, then a (Fig. 151) becomes the plan for the normal arrangement of groin vaults. The Renaissance is known to have entirely followed Roman architecture and gave absolute preference to the groin vault without ribs, over the mediaeval vault with ribs.

γ. The Roman dome.

The dome is bounded by spherical surfaces; all sections through a vertical axis and passing through the vertex are great circles. From structural and decorative reasons, we are obliged to distinguish between domes simply taken, or hemispheres, half domes or quarter spheres, and lastly domes constructed on polygonal, square or triangular plans, the so-called pendentive domes.

The simplest mode of constructing domes is to compose them of horizontal rings of voussoirs, all their beds and end joints being directed toward the centre of the dome; each voussoir t

therefore has two radial beds and two vertical end joints. The apex is coromed by a conical keystone, its under surface being concave spherical. If such a dome is built of cut stone it can be made a coffer dome by applying the principles already found to govern tunnel vaults of stone. If it be built of brick, for which purpose block bond entirely composed of headers is usually chosen for both structural and economical reasons, but ornamental bonds are not to be excluded from small domes, the decorative motives that may be produced by these bonds give abundant means for the ornamental treatment of the surface of the dome; the general ground principles are conclusive in this case, as in all Tectonics, the border form at the base of the dome, its detached apex, the courses in horizontal rings, the vertical and diagonal directions of the brick bond, all furnish starting points for the entire decoration.

The dome may also be regarded as being divided into sections by meridians, which diminish toward the vertex, and may be composed of blocks of stone having thinned edges toward the apex; this unpractical mode of construction should be regarded as merely fanciful, but was a great favorite in the late Renaissance of Holland, for niches and small domes.

A combination of the two modes of construction is found in the use of coffer domes, in the architecture of the Romans and the Renaissance, carried out on the greatest scale in the Pantheon in Rome. A series of vertical arches diminish toward the vertex by offsets and form great circles of the dome, and are connected together by transverse arches, the interspaces between the arches are filled by coffers. (Viollet-le-Duc. Dict. Rais. IX. p. 475 et seq.).

In the dome of the Pantheon a refinement was first employed, which had a pernicious effect in later times, and led the Renaissance masters into error; the side surfaces of the hollowed coffers without exception radiated from a central point in the axis of the dome, so that instead of the coffers was introduced a perspective architecture, which only appeared in some degree correct from the centre lying in the axis of the dome, but had a distorted effect from any other point of sight; at this centre the side surfaces of the coffers entirely vanished from the view of the observer. For our modern era to commend this

theatrical effect as an ingenious idea as frequently happens, can scarcely be termed otherwise than an error of judgement of the esthetic faculty. The lower edges of the coffersonly should be inclined downward, so as to all become visible, but not the others.

A peculiar form of dome is obtained by constructing it of horizontal rings and also with sections diminishing toward the vertex, if the vault is executed in herringbone bond as in the dome of Florence cathedral. This produces a pleasing arrangement that may be decorated in various ways by the use of colored bricks. According to an allied principle a dome may be conceived as being formed of separate spherical triangles or rhombuses, their sides forming great circles and partly spherical spirals on the surface of the dome, which terminate at the vertex, a mode of construction never yet executed, though allied to many late Gothic star vaults.

On the plan of any dome may be drawn a regular system of straight lines, that are to be regarded as being the horizontal projection of a system of circular arcs lying on the surface of the dome. The separate spaces of such a regularly divided domical surface may be filled with brick masonry, regularly arranged in a fixed direction. We find two separately existing and very strong domes in the temple of Jupiter at Spalati, and in the temple of Minerva Medica at Rome; the former consists of horizontal series of arches turned over each other, the interspaces being filled with concrete, the other being of doubly curved vaults turned between meridian arches, so that the dome is shaped like a muskmelon. Strictly speaking, the mediaeval ribbed vaults of all kinds are nothing but combinations of regular systems of ribs, whose intervals are filled by similar vaults of double curvature, which are partly spherical-elliptical, partly horn-shaped ellipsoidal surfaces like those of the melon vault. (Fig. 153).

The domes built of pots employed not only by the Romans but also by many modern architects for covering wide rooms with the minimum weight, hardly require consideration, since they are almost always covered by plastering. If the construction of such domes is to remain visible, the bottoms of the pots would be placed toward the centre of the dome, the joints be filled with mortar, cement or plaster, which might be painted

or gilded, while the bottoms of the pots could be ornamented by pressed ornaments.

The half domes of niches are chiefly distinguished from domes in their construction and decorative treatment by the fact, that generally not their vertex but that point on their lower edge farthest from the eye of the observer is to be regarded as their pole, so that the axis of the half dome is horizontal. If the half dome is to abut against an entire dome so as to resist the thrust, as in many buildings having the plan of the Greek cross, or terminates in a tunnel vault, it should be constructed as a half dome with vertical axis and be decoratively treated accordingly or like an umbrella, while domes over niches from the earliest times are usually treated in forms like a muscle shell and thus termed a concha. The concave attracting and inviting character of the niche leads the eye to the pole of the half dome or concha, and appears as that point of the construction where the eye feels restricted, from whence the energy of the whole appears to radiate, and which seems to have retired to the farthest point. Similar ideas had led almost all nations to decorate the concha by radiating forms, as if pencils of light radiated from the pole in all directions, which may be compared with those of the sky when the sun sinks below the horizon. Hence in churches the pole of the niche is usually ornamented by the face of the divine being represented, or by a symbol representing this. Roman and Renaissance architects generally preferred to decorate the conchas of small niches by shells, especially in case of fountains and cascades.

In Holland during the late Renaissance it was a favorite idea to construct the domes of niches with radiating voussoirs diminishing toward the pole, this was carried so far as to cut bricks to form sharp intersections at the pole, while the radiating lines of the brick bond were only a quarter brick apart at the outer edge of the niche.

All entire domes and domes over niches may then be termed an umbrella domes if their vertical axes are accented, whether actually divided in sections by great circles, or meridians and zones are only indicated as in church domes, sprinkled with stars or decorated by soaring angels, etc.; all those domes over niches may briefly be termed shell domes, in which the pole of the principal axis is treated as the principal point;

to decorate an entire dome by taking any axis other than a vertical one as a base would be nonsense, and the same would be true of a niche dome in which the top and rear were ignored, while the right and left sides were made prominent. (See *Tectonics*, Chapter on order and estimation, p. 81 et seq.).

Pendentive domes are produced by constructing a polygon of any form whatever, whose angles lie in a circle or in an ellipse, if the dome is to be elliptical. In architecture this is usually merely a regular polygon with three, four, five or six sides. All regular pendentive domes are in part directly supported by the piers; for example by the piers a, b, c, d, the remainder resting on the arches a c, c b, b d, d a, erected above the sides of the polygon. The radius of the dome equals the radius of the polygon circumscribed about the polygon, and therefore equals the half of the greater diagonal of all polygons with an even number of sides. If a plane be passed through the vertices of the arches, which have equal heights, for regular polygons, this separates the pendentive dome into an upper calotte and as many pendentives as the polygon has angles. The plan of the calotte is identical with the circle inscribed in the polygon.

The pendentive dome should always be decorated from a different point of view than the dome; besides the vertex it has n lowest and n characteristic points, corresponding to the centres of the arches, which require esthetic prominence, they are usually constructed by making the courses horizontal and corbelled out diagonally in the pendentives up to the base of the calotte, which is then constructed alone as a dome. Hence the decoration naturally has reference to the characteristic points, or if the calotte be constructed independently from the pendentives, which is perfectly proper when those are built of horizontal courses, the characteristic points are not made prominent on the calotte or are merely indicated. The borders and the prominence of the vertex by a keystone will be decisive in both cases, and the indication of diagonal lines in the first case, and the development of the pendentives in the second, will be equally so. The pendentives gradually increase in width upward from the piers, and afford opportunities for the introduction of polygonal or circular medallions; they may be so d

decorated, that the ornament is gradually developed from the lowest part of the calotte. The calotte should be divided from the pendentives by a border or a cornice.

All domes, whether segmental, semicircular, elliptical or of other forms, require a keystone to terminate the vault.

The smaller the rise of a vault the less is the load that it may safely support by its conditions of stability, and the greater its rise as in case of a pointed arch, an elliptical arch with vertical major axis, a parabolic or catenary arch, the greater will be the load which may be placed on it, and also the greater will be the weight that is required to be placed on its vertex to ensure its stability.

Further the completion of a dome is always technically difficult in vaults of great span, and an opening is commonly required at the vertex, partly for the admission of light, partly for the purpose of hoisting building materials, etc. From these points of view, the following rules for special cases are derived; Segmental and semicircular domes of small span are not properly finished with a keystone, which in very small domes should be so shaped as to exert no thrust. If the diameter of the dome exceeds a certain measure, a complete stone ring is preferable to a keystone, the centre remaining open for admitting light, hoisting building materials, and which can at last be filled with a stone more or less flat.

Stilted or raised domes with a height exceeding their radius must be loaded in a peculiar way and therefore require massive keystones, which may be bold suspended rosettes in complete domes, or should be a circle of heavy, thick and deep voussoirs in domes open at the top. In very large domes like those covering the Pantheon at Rome, the cathedral of Florence, the church of S. Peter at Rome, the church of S. Sulpice in Paris or of S. Paul in London, three domes are placed above each other, the lowest or true dome having an opening at its centre, the second being steeper and supporting the lantern, while the third is the external covering dome, whose weight with that of the second dome combines with the horizontal thrust of the first dome as a vertical pressure. The upper ring of the inner dome may then support a gallery and may be connected by a colonnade with the upper closing ring of the second dome, which

supports the lantern; but this colonnade should not cause too great a load on the lower dome, nor should it support the closing ring of the second dome, since in both cases the lower dome would be in danger of falling, and the second dome would be useless.

The closing rings and keystones of domes being the highest and most prominent structural parts give opportunity for particularly rich treatment, in lightly constructed domes of low rise, the requirement that the crown of the dome should be loaded as lightly as possible demands the use of hollowed sections in the closing ring, which then more or less closely approximates the form of the edges of a flat dish, while on the contrary, strong domes that require loading need to have their deep crowns loaded with as much weight of decorations as possible.

Pendentive domes permit the construction of hemispherical or stilted domes in place of a calotte above the cornice, which terminates the pendentives, a mode of construction especially peculiar to Byzantine architecture, which was retained in the French Romanesque style and which is justifiable in many cases.

In connection with the treatment of towers, we shall describe domes in connection with their supporting walls and arches, forming transitions from the square to the octagon, which are found in mediaeval towers over intersections, as well as in other towers and domes of churches.

b. Mediaeval Vaults.

Mediaeval vaults are ribbed and are based on the groin and tunnel vaults and the dome, but their separate surfaces are constructed as portions of domes between the ribs. In addition to these are cloister vaults that require mention.

α. Mediaeval groin vault.

We have followed the structural principle of the Roman groin vault so far as it was developed without becoming untrue to its character, which is always based on the intersection of two tunnel vaults. The elliptical form of the diagonal ribs caused inconveniences in stonecutting differing for each separate stone. The mediaeval groin vault sought to free itself from all inconveniences of the Roman groin vault, and formed the diagonal ribs as semicircles. Then this arrangement is only attained with consequences more or less troublesome; if the

side aisles are semicircular, their crowns are lower than those of the diagonal ribs by the difference of the half diagonal and half side; the vault must then rise from the side arches to the crown, unless one is willing to raise the crowns of these arches to the same height as that of the vault, either by making the abutments of two different heights, which produces a very awkward treatment of the capitals, or by stilting the side arches, which is not very pleasing.

The inconveniences are increased when sectangular bays are to be covered by groin vaults, and both side and groin arches are to be semicircular; we must then have different heights of the crowns or of the abutments, or stilt both kinds of side arches. In lectures on mediaeval architecture every expedient for the removal of these inconveniences is described, that was employed by the Transition and Gothic styles. We shall here only treat these from the material stand point so far as the decorative development may be concerned.

The use of the elliptical arch for diagonal ribs may be avoided if an oval arch be substituted for it, and if this be struck from as many centres as possible, it is hardly inferior in its continuity; if the diagonal arches are semicircular, the side arches require to be stilted by about $1/8$ their radius, since the abacus of the impost moulding of the pier would otherwise conceal the lower ends of the arches, which looks worse in arches of small span than in those of wide span with an equal projection of the abacus; but for the vault to rise from the crowns of the side arches to its own crown is not only not ugly but is even preferable on esthetic grounds, if the lesser illumination of the crown be neglected. Such vaults do not convey the idea of pressure but that of a free sweep, and an increase in the height of their crowns corresponds to an increase of span. In low rooms retaining the same heights of crown and side arches, we can employ the expedient of placing the springing joints of the diagonal arches below those of the side arches, or the segmental arch may be used.

As for the introduction of springing points at these different heights and the correspondingly varied capitals, this arrangement is incontestably the richest and most pleasing of all possible methods on account of its variety, the most pleasing

and consistent structurally but also the most costly; to be willing to sacrifice for this reason in monumental structures because the end may be attained by simpler means, as unfortunately done in the more perfect Gothic, is to be robbed of one of the finest art expedients by poverty of ideas. If it is desired to employ in exceptional cases the extreme means allowable in art, when everything normal seems trivial, one should then not fear the higher cost.

In case of poverty of construction or mean proportions of the room to be vaulted, a moderate stilting of the arches as well as a moderate raising of the crown of the vault forms the means best adapted to produce the extreme measure of a pleasing effect, attainable by greater propriety. In quite oblong groin vaults the heights of the crowns of the arches on the longer sides and those of the diagonal arches approximate each other in some degree, but on the contrary the end side arches require to be considerably stilted.

It is well known that the early Gothic style employed suitable expedients and made the side arches pointed to obtain control of the heights of their crowns without being compelled to use the circular arch, which was only retained for the diagonal arches. They then had the choice of constructing all the side arches with the same radius as for the diagonal arches, and which is technically preferable because all voussoirs can then be wrought by the same template, special imposts and keystones only being required; the crowns of the three arches are then not at the same height; or the heights of the arches are arranged at pleasure, making the pointed arches dependent on these, which may then be made equilateral pointed arches requiring to be stilted, or so that the narrow or side arches are lancet arches with a common springing plane.

It is always most judicious to use a single radius for all the arches, to allow the crown to rise gradually, and to stilt the arches about $1/8$ their height. To make the groin arches pointed is entirely useless, in case the vault be not very heavily loaded.

The pointed arch is to be preferred over the circular arch for the side arches, because with a moderate difference from the round arch it is more piquant, aspiring and dignified. If

we once become accustomed not to recognize the Gothic style in every case in which the pointed arch may be used, it becomes allowable in the Renaissance as well, to be employed whenever appropriate. The early Renaissance disdained it as little as Gothic rejected the circular arch; the spirit of each style was too discreet to reject anything practically usable, from blind subjection to principles.

The separate compartments between the ribs were always so covered in mediaeval vaults as to make their highest line curved, and they therefore became parts of domes. Two modes of vaulting were in use, the vaults being either constructed after the classic method of building tunnel vaults by courses at right angles to the axis of the tunnel vault, or diagonally in later times so that the length of one half the side arch being transferred to the diagonal arch gave the point, which was connected with the crown of the side arch. The other points of the diagonal arch were connected with the corresponding points of the central curved line of that compartment of the vault. The separate portions of the vault very heavily loaded the diagonal arches in the first case, but in the second they intersected above the ribs, so that this bonding together was of itself quite strong, and the ribs proper had but little to support and served rather as stone centerings to somewhat relieve the vaulting.

If the vault exceeds the normal width of the smaller bays, as first happened in the vaults over the intersections under the towers of the larger French cathedrals, there were two modes of dividing the groin vault into smaller compartments, it was either divided in plan into 8 equal though smaller compartments to form octopartite groin vaults; the inconveniences of springing points of unequal heights, of unequal heights of crowns, of stilting or the use of different forms of arches were increased, for $a d$ and $d b$ (Fig. 154) become semicircles, and $a c$ and $d c$ are different quadrants if pointed arches are avoided; but if they are used the diagonal ribs $a c$, $b c$ are quadrants, $c d$ and $c e$ are half pointed arches, while $a d$, $b d$ are either semicircular or are entire pointed arches, the problem may also be solved by the use of segmental arches without introducing too many unpractical results. Or the

groin vault may be divided into smaller compartments by cutting each of the original compartments into three. The results are as follows; $a d + d c$ (Fig. 155) is greater in plan than $a c$; if the crown of the vault is to be its highest point, which is not absolutely necessary since a vault may rise higher than its crown, when the crowns of the side arches are higher than that of the vault, causing the centre lines of the compartments to descend toward the keystone, the radius of the longest arch, as $a d + d c$ is to be taken as the basis of the construction of the vault; in the later middle ages this arch was termed the "principal arch." The keystone c is at the height of $a d + d c$. The point d' lying above d has the height $d d'$ in the vertical projection. How shall the crown c of the vault be connected with the springing point a ? If the half diagonal $a c$ of the plan be laid off in the vertical projection from a to c' , a brief consideration proves that the vault rib above $a c$ of the plan must be a pointed arch differing very little from the semicircle $a d + d c$.

On the contrary, if the diagonal be assumed as a basis for the construction and the diagonal rib be made semicircular, the crown c of the vault is lower than in the first case, its height being $a c$. If $a d$ (Fig. 156) be drawn in the vertical projection, and $d c$ of the plan be laid off from d to c'' , the point above c'' does not have a height equal to that of the crown c' of the vault but is lower. Therefore in general this method leads to no result. One must rather either strike an arch from the point d'' over d to the keystone c with the radius of the diagonal rib (Fig. 156), or transfer the magnitude $c d$ of the plan from c to d''' towards a , erecting a perpendicular d'' to cut the quadrant in d''' . The height d''' is then that of the point lying over the point d of the plan. We may now strike an arch from d''' toward a with the radius of the diagonal rib, or draw a segmental arch with the same radius whose centre z lies on the line $d''' d''$ produced, cutting off the height $a d'''$ over the springing point, or lastly a circle may be drawn through d''' with radius $a d$ tangent to a vertical drawn at a . It becomes evident that turn and twist as we may, inconveniences will result always and must be taken into account.

A few considerations connected with observations of actual

structures will place the various difficulties in a correct light, which result from the construction of groin vaults in accordance with mediaeval principles. If the sections of all vault ribs and side arches are similar, or those of the side arches are composed of the sections of one rib and two half ribs, it will always be preferable to employ a single radius for all ribs and side arches, to simplify the process of construction. In this case one has only a choice of using segmental or pointed arches in addition to the semicircular arch of the diagonal rib. The form of the segmental arch is generally associated with the idea of the secular, of the absolutely essential at the expense of beauty and of the mean, while with the pointed arch is joined the idea of the ecclesiastical, the monkish, which is not agreeable to every one. This contains a hint concerning the choice of one or the other form of arch. If the segmental arches are neither principal ribs nor side arches but only intermediate ribs, they are not displeasing in contrast to circular or pointed arches; since their oblique springing from the vertical gives a picturesque effect to the vault; vertical division walls rise from a to d'' and d''' in the example (Fig. 156), if the arch $d''d'''$ be segmental, whose joints remain horizontal up to the commencement of the compartments of the vault and are limited by the rib $d''d'''$.

To take a fancy to the exclusive use of circular arches would in many cases result in the greatest amount of labor with an esthetic effect affording very little pleasure; highly stilted arches appear well only in exceptional cases, and a strong curvature that detaches small circular arches from their tangents is very disadvantageous. To discover the best relation between the amount of labor and a pleasing result in a special problem frequently requires many trials before a decision can be made.

The two examples of the division of the groin vault into several compartments include all complex varieties of multipartite and ornamental groin vaults. Multipartite groin vaults may be erected on any polygon, the heights of side arches may be assumed as required, as well as that of the vault, since the crowns of the arches may be arranged to bring the springing points of these arches high above those of the diagonal ribs, which is often necessary in vaults of towers, or desirable for

free admission of light and to avoid transmitting the horizontal thrust of the compartments of the vault to the side walls, the vault then rising considerably from its keystone to the side arches.

The richest and most complex ornamental vaults are easily solved by the simple example, among which we include all ribbed vaults divided in compartments in various ways, which may be derived from the groin vault with the exception of the star vault, which is to be regarded as an ornamental vault; still structural investigations are to be made in each individual case to make it as clear as possible. If one starts from the principle that the crown of the vault must be its highest point, that all its ribs must have the same radius of curvature, and all intersections of the ribs must always be higher toward the crown, the 'principal arch' of the vault becomes greater than the half diagonal and $= a b + b c + c d =$ the sum of the distances between the horizontal projections of these intersections, by means of which a constant increase in height is possible, between the springing point and the crown. To the points a, b, c, d, e, f of the plan correspond the heights a a', b b', c c', d d', e e', f f' of the vertical projections. From c go off the plan and obtain c g on the vertical projection with the curve c'a', or b g'' with the curve b'a''. The height e e' can then be always taken at pleasure. If the half diagonal a f be taken as the principal arch, lay off from f on the vertical projection (Fig. 158) the distances f c, f b, f e toward a, erecting perpendiculars at those points, whose intersections with the quadrant a f' with radius a f' give the heights b, c, e, g, f. all points then lie on the surface of a sphere, and the vault then becomes an ornamental vault, which we term a star vault.

If the largest possible principal arch $= a g + g b + a b + b c + c d + d l$ be taken as the basis of the construction, the rise of the vault would be great (Fig. 159); if a low ellipse or a Tudor arch were taken instead of a circle, a favorite form in the late Gothic of the Netherlands and of England, the heights a, g'', b'', a'', d'', f'' would be obtained, or the points a, g'', b'', a'', c'', d'', f''.

If one does not follow the two previous modes of procedure, for determining the altitudes of the ornamental groin vault by a single radius, but first assumes the height of the crown a,

the side arches A B and B C (Fig. 160). connect these crowns by the arches a'd', which correspond to the simple curvature of the groin vault, transfer to the vertical projection the lengths a b, a c, a d of the plan, erecting verticals at b and e, which intersect the curve a'd' in b'c', there will be obtained an ornamental groin vault, all whose ribs will be constructed with different radii. The two first modes of construction may be termed German, and that just described is French; it was chiefly employed in France and England during the middle ages. Vaults on the German plan generally have some advantages over the last, which produces a monotonous and consistent effect, while on the contrary the former appear rather capriciously varied. On practical grounds they are to be preferred to the French.

3. Mediaeval domical vaults.

Simple mediaeval domes are constructed differently from the Roman; in general the dome was not much liked. The ornamental domical vaults of the late middle ages, which we have already considered as star vaults, are preferably employed for covering polygonal rooms; all intersections of the ribs lie in the surface of a sphere, whose radius equals that of the inscribed circle. The compartments are covered as spherical surfaces of small curvature between the ribs.

Since the compartments are the stronger in both groin and spherical vaults, the more that they are curved in cross section, i.e., the greater the rise of any single arch of the compartment in proportion to its span, in strong vaults these compartments are sometimes so strongly curved, that their highest point is considerably above the crown of the vault (Fig. 161). Such so-called "full breasted" groin and spherical vaults appear more animated and varied than the "flat breasted", since the strongly curved compartments afford a richer contrast of light and shade. Therefore the "full breasted" are to be preferred, if not painted, to the "flat breasted" if painted.

γ. Mediaeval tunnel vaults.

The simple mediaeval tunnel vault without ribs differs as little from the Roman as the simple dome, but the ornamental tunnel vault is different in very essential points. That of semicircular cross section is formed in the simplest way by

making the half span $a c$ (Fig. 162) equal to the height $c c'$; the altitude of the point b equals that of c' , since $a b = a c'$. Consequently the points b, c, b are connected by a straight piece on the vertical projection.

The construction is suitable for elliptical vaults required for low rooms. If the rooms are very low and require a height less than the half span, one may take as a principal arch a segmental or Tudor arch as in the Netherlandish and English system. Yet the most natural mode of constructing the ornamental tunnel vault will be to take the diagonal arch $a b c b a$ (Fig. 163) as the principal arch, which is made a semicircle; all ribs are then made with the same radius and all intersections lie on the surface of an elliptical tunnel vault, whose major axis is vertical. (Fig. 164).

In larger rooms a second series of ribs is inserted between those of the first system (Fig. 165), and which are constructed on the same principles. Further, ribs can be struck to the side walls as segmental arches with springing points lying above the general springing lines; the tunnel vault may be further ornamented in the most varied ways. All these constructions and their variations being fully treated in any good manual of Gothic construction, we have here only to consider those matters most important in modern practice. These ornamental vaults of all kinds have intimate relations to the Roman coffered vaults, as may easily be seen, essentially differing from them only in having vaulted compartments instead of coffers. As we have seen, the ribs are unnecessary in the mode of vaulting at right angles to the axes of the compartments, strictly speaking, since the brick bond of the compartment forms a species of stiffening rib along the intersecting edges, that does not project beyond the surface of the vault.

The late Gothic sometimes employed ornamental vaults without ribs, whose compartments have the form of sunken pyramids with curved surfaces, thus being vaulted or cloister vaults with slightly curved inner surfaces (Fig. 166), especially in Saxony. Such vaults specifically belong to brick construction and deserve to be imitated in purely technical buildings, and when it is desired to produce a rich effect with small means.

5. Decorative motives of mediaeval ribbed vaults.

The definitive elements that settle the external appearance of the mediaeval vault are the ribs themselves before all else, their geometrical arrangement already considered, the proportions of their dimensions to those of the compartments, their profiles, keystones, developments above their imposts, and lastly the decoration of the compartments.

The treatment of the imposts will be considered in connection with the forms of the supports and of their capitals, and we shall therefore here limit ourselves to what is to be said of the vault itself. This has been sufficiently explained from esthetic and technical stand points, it only remains to state that the side arches, which in rooms containing free supports connect these together and with the walls, make strong archivolts and smaller ribs necessary and desirable for both technical and esthetic reasons; if the side arches support heavy loads like those of churches supporting the walls of the clearstory, or those of warehouses, cellars, etc., that support goods, furniture, implements, men and other external loads, they must again be strengthened. Rooms containing several aisles and having a raised central aisle, require very strong longitudinal pier arches, arches of less strength to connect the supports and serve as transverse arches, but ribs to support the compartments of the vault, whose strength is only proportional to the weight of the vault. For such vaults to produce the impression of great strength, and so that the entire structure may have that of power and reserved force, the archivolts and ribs must appear massive in proportion to the compartments of the vaults; on the contrary for lighter constructions to have the effect of lightness and grace, the side arches are entirely unnecessary in lightly loaded vaults and should be replaced by ribs.

The ribs and side arches act like girders and similarly to loaded beams of curved form (Fig. 167); i.e., their strength increases more rapidly with the depth than the width on one hand, on the other the fibres most distant from the neutral axis are most strongly stressed. From this results for structural reasons the requirement in relation to their form of section, that its depth should exceed its width, that it should be strong at top and bottom, while it is allowable to reduce the section between those limits. In the older mode of vaulting,

when the separate courses are perpendicular to the axis of the compartment, the ribs and arches have a strengthening addition at their upper edges (Fig. 167), against which abut the compartments; but this addition is unnecessary in the diagonal mode of vaulting; therefore strong ribs and arches convey the impression of strength, and the permissibility of reducing the section between intrados and extrados allows the use of coved mouldings, while the intrados fulfils its function as a massive round. In case of unloaded or slightly loaded ribs, their sectional forms and proportional dimensions may be determined independently from the conditions of loading. Hence the German Renaissance decorated with fillets the ribs of a ribbed vault, (Fig. 169), constructed according to Gothic principles, and this makes the light loading evident. These ribs have a very pleasing effect where used; the rows of leaves on both sides are decorated by pearl beads, cable mouldings, etc.

The sections of strong bearing ribs in which mediaeval architecture was very fertile are yet restricted within very narrow limits; the lower edge alone appears most powerful and bold, when treated as a round or pointed bowtell; at a distance the pointed bowtell has a more energetic effect than the round, which may also be replaced by a cove or a sharper edge; all attempts to replace these very simple forms by those more complex are without result, since it is so easy to fall into littleness. The middle ages created in the profiles of the ribs, not merely members peculiar to its architectural styles, but corresponding to the developed vaults and of enduring value; leaf mouldings with pearl beads and bands, which express the relations of the ribs to the vaults as bearing members, and harmonize well with the sections of the ribs. Therefore it is scarcely reasonable to refuse to use the form because original to the classic styles. The mediaeval motive of using bands set with semi-precious stones to separate rounds and hollows is also very appropriate in the decoration of the ribs, and is effective at even a considerable distance, where other forms become indistinct.

Only in vaults intended to be close to the observer may the separate mouldings be enriched and be divided into smaller parts, yet even in this case a bold treatment of the section of

the rib will always be best.

The side arches that support the walls must have breadth as well as strength. In this lies an essential difference from the smaller ribs, and on it is based their different decorative treatment.

The breadth of the side arches is determined by the thickness of the walls that they support, and since the strength of the side arches also increases with their rise, the two requirements of breadth and strength will be sufficiently satisfied if they are built of several rings of courses, whose depths are determined by the thickness of the layers in the quarry. The side arches accordingly consist of two or three courses of arches according to the thickness of the wall and the loading, and these may be arranged in full or half steps as required, so that the side arch produces the impression that the walls, of their own motion and their strength have laid bare their interiors. The simplest and most appropriate mode of profiling the side arches consists in arranging these sections in steps or "orders", whose alternation of light and shade gives the boldest effect. Their relation to the burdening compartments of the vaults is made evident by the elastically curved rows of leaves with some fillets (Fig. 171). If the profile is to have a richer form, the angles may be replaced by separate groups of a round between hollows, giving the impression of energetic force, and if it be desired to strengthen the lower end of the stepped side arch in reality as well as in appearance, a pointed bowtell will fulfil this purpose in the best way. By rational procedure we thus reach forms similar to those introduced by the middle ages in its grandest churches; we can never dispense with these model profiles belonging to the 12 th and 13 th centuries in case of similar problems, but on the contrary all the alibored refinements, which were such favorites in the late middle ages, should be thrown aside as being practically worthless, though historically interesting.

Since the side arches not only support the vaults, but also keep the piers apart and at the same time connect them, and are arranged in connection with each other, their horizontal lower surfaces may receive band-like patterns which express this connection. All periods and nations have expressed this idea, each in its own way.

Smaller vaulted rooms, whose piers are connected by side arches and which are covered by ribbed vaults, do not require massive side arches unless exposed to unusual loads; such side arches may very well be treated as broader ribs in case of small and lightly loaded vaults, since they principally act as abutments on the wall surfaces for the compartments of the vaults and will then be portions of a side arch, so that the other sections may be obtained from that of a rib by doubling or halving its width.(Fig. 172). It is then perfectly correct and is also one of the simplest and cheapest of decorative expedients to replace the angles of the ribs and side arches by chamfers or coves, to increase the effect of light and shadow.

In most cases if columns are connected by arches, Roman and Renaissance architects have treated these arches like the classic architrave corresponding to stone beam construction, even forming coffers in the under surfaces of these archivolts. The Roman and Renaissance masters have either committed a fault in treating the arches like curved beams of stone, or our ideas of the meaning of the form of the archivolt are incorrect, and they must be correct.

The architrave form as a supporting stone beam above a colonnade was peculiar to Grecian architecture, its division into several horizontal courses, the decoration of its under surface by band-like patterns, expressed the idea that the columns should be connected by a tightly stretched band, on which a load might be laid without causing it to bend.

But the Greeks themselves employed this architrave form to enclose windows and doors, and even used it as an archivolt: at the aqueduct in Athens, and it therefore becomes untrue, or other associations of ideas have become connected with these forms; in this case the Roman and Renaissance masters simply accepted the forms of the Greeks, perhaps without understanding the ideas associated with these forms by that people. But they seem to have differed from those which we have been accustomed to connect with the architrave.

The classic styles conceived an opening in a wall as merely a hole, separated from the masonry of the wall by a bordering frame, but the middle ages regarded it as an opening producing the appearance by its simple splays or recessed steps, as if

the wall had opened of its own accord, laying bare its interior. it is self evident that bordering frames are not wanting in even mediaeval walls, but are arranged beneath the supporting side arches which play the chief part, the structural elements predominating even if the construction is not of the greatest importance, as in wheel windows and in other principally decorative works. The Greco-Roman architrave is not only the band connecting the columns, but is more generally the dividing member, which separates the open interspaces between the columns from the frieze and cornice, the masonry of the wall from the roof cornice, and the opening in the wall from the masonry; it acts in different ways and for different purposes, and its meaning will therefore depend on the system of construction employed. To divide its under surface into coffers would be opposed to its significance; only the tunnel vault requires to be lightened by coffers, but neither the architrave nor the archivolt; its under surface is adapted to free ornament, which connects it to the points of support, but the coffers are only appropriate for actual tunnel vaults. The archivolt constructed on the Greco-Roman principle unites very well with the mediaeval vault, so long as the development of the pier is in accordance with the classic principle, i.e., if the pier affords separate abutments for the imposts of the arches, so that each arch may be freely developed. On the contrary if the imposts are so formed that the ribs and side arches intersect and interpenetrate at their ends, the archivolt cannot be developed throughout its entire extent, the piers become true clustered piers as in the best mediaeval period, and the archivolt has then lost its significance, and it is preferable to treat the ribs and side arches in accordance with mediaeval principles.

The treatment of the pier, capital, and impost stones, will afford us an opportunity to return to these points, and we still have to treat of the massive arches employed in bridges, viaducts and similar technical designs; still we shall speak of these constructions in considering the connection of piers and columns by entablatures and arches on one hand, on the other the same is true for these as in case of tunnel vaults, and partly the results of our investigations on openings in walls. We must here refer to those Chapters.

Ribbed vaults as well as domes and Roman groin vaults require keystones for structural reasons, and for which what was previously said is true; if the vaults are light, they need not be unnecessarily burdened by the keystones, but if they require great strength, the diagonal ribs must be constructed as projecting arches, as a pointed arch may be erected that requires a special load at its apex. The keystone supported by the ribs is most appropriately and characteristically decorated by a suspended flower, a garland of leaves and flowers, by allegorical representations, shields, heads, etc., and its width may correspond to the greatest breadth of the arches at the point where the ribs abut against it (Fig. 173).

If the keystones serve to suspend chandeliers, or if bell or scaffold ropes pass through them, they must be perforated, and their decorations must be arranged around the central opening; if bells, building materials, etc., are to be hoisted through them, they must take the form of a circle of voussoirs, whose decoration must be treated in accordance with the principles established in treating of keystones of domes.

In ornamental vaults are found several kinds of keystones, subordinated to each other according to rank. The principal keystones, of which each vault perhaps has but one, should possibly be decorated by sculptures, human heads, etc., the inferior keystones by sculptures, Shields, symbols, etc., while those of the third and fourth rank receive rosettes and leaf ornaments.

Both the middle ages and the Renaissance sometimes treated keystones as massive suspended forms, the so-called pendants, that are especially appropriate if the walls must be heavily loaded, when they must seem heavy to the eye, i.e., be massively treated, or when intended to receive chandeliers, when they may have the form of graceful suspended chandeliers. Exaggerations in this direction, i.e., the use of pendants for purposes merely ornamental and permit their use when without any meaning whatever, is one of the many errors of the later middle ages and must be considered objectionable.

As for the decorative treatment of the surfaces of the compartments, we first have to consider them only so far as they are not plastered and their construction is visible. The earlier

middle ages almost always constructed the compartments of vaults of cut stone, sometimes with unusual dimensions, so that the massive vaults were in condition even to resist the injuries of a fire, but required correspondingly powerful abutments and flying buttresses. The great activity in building during the 12 th and 13 th centuries demanded a rapid mode of constructing buildings, the vaulting demanding a large expenditure of time and money. Hence no attention was paid to the decorative treatment of the compartments of the vaults. It was a toilsome labor to prepare the separate stones, which were not very large and were chiefly placed at a considerable distance from the eye of the observer, so that little or nothing was done in a special esthetic treatment of the separate elements of the vault at great cost. Neatness and accurate execution, a soft and yet clear play of light and shade on the surfaces of the vault resulted both from their arrangement and the general plan, remaining during the entire middle ages -- and still remains -- the principal requirements for a pleasing effect of the vaults, which was further heightened by the bond employed, and by the texture of the visible surface and the lines of its joints.

Modern vaulted construction seldom uses cut stone but commonly brick for filling the compartments of vaults; the most natural decorations consist in the formation of a border and in the use of decorative bonds, the more carefully the vaulting is executed, the more pleasing will be the effect obtained; the mosaic-like joints of brick masonry have an appearance allied to that of textile fabrics, and an analogy in the treatment of vaults thus arises, similar to stretched and freely suspended tapestries, and to textile fabrics, since all space enclosing masonry recalls the tent roofs, both by its structural bond and by its external surface, which were suspended between pillars for protection from light, wind and weather, against external enemies and inquisitive eyes.

e. Cloistered vaults.

Not much may be said of cloister vaults not already stated in the preceding discussion of vaults; they are the converse of groin vaults because though produced by the intersection of tunnel vaults, all those parts are retained that are omitted

in groin vaults. At the line of intersection the bond itself forms strong strengthening ribs, so that separate stone ribs are unnecessary, a keystone is required as in domes and ribbed groin vaults, the compartments need the same treatment as in compartment vaults, and cloister vaults on polygonal plans approximate in form to domes, whose decorative treatment they also follow.

c. Renaissance Vaults.

When the Renaissance did not directly employ the Roman or mediaeval vaults then usually ornamented by painting or stucco work, it generally employed low compartment vaults in combination with the so-called Welsh groined vault (Fig. 174), which also offered large surfaces for painting and decoration in relief.

Such compartment vaults, which were mostly vaulted from their angles toward their centres (Fig. 175), are more or less modifications of domes and cloister vaults in combinations with portions of tunnel vaults and may be decorated by the formation of borders, a greater prominence of the centre, or by accentuating the transition from one form of vault to another, in accordance with the use of decorative bonds; these accentings may be produced by projecting ribs, which have less structural than a decorative purpose, whose intersections may be enriched by keystones of all kinds. The compartment vaults of this kind are the less suitable for heavy loads, the flatter they are, and are only justified by most careful construction and the use of the best mortar, seldom remaining unplastered, but are principally arranged with a view to decoration by painting and stucco.

To the Renaissance vaults may be added fan vaults derived from ornamental groin vaults, and introduced in the English late Gothic style, though in construction they are more nearly allied to Roman and Renaissance vaults. (Ereymann's *Constructionslehre*). They are strictly combinations of annular surfaces and are therefore bodies of rotation, whose sections may be circular or otherwise, so arranged that the interspaces that exist between their upper bases are either filled by inverted domes, segmental domes, or lastly by pointed vaults (Fig. 177); if the half diagonal be taken as the radius of the vault instead of the half distance between supports, the diagonal sections

of the vault will be circles, and the right sections are pointed arches with crowns lower by the difference between the half diagonal and half span, and from these a sharp and gradually disappearing intersection line of convex curvature rises to the apex of the vault (Fig. 178); each compartment of the vault borne by one support is in plan a square portion cut from an annular surface of circular section, and these surfaces closely join each other without leaving any gaps between them.

These fan vaults have something very characteristic in their external appearance and vividly recall the leady foliage of the fan palm uniformly spreading outward on all sides, and they must always be decorated by accenting the horizontal lines in accordance with the horizontal lines of the stone construction. Very pleasing decorative motives are connected with the domical surfaces, used for filling the interspaces between the compartments of the vaults, circular in plan, and the arrangement of semicircular diagonal sections leads to a peculiar treatment of the keystone. Arches are unnecessary in fan vaults, being mostly in disagreement with them; on the other hand constructions in stone are possible, which consist of a series of fan-like ribs connected together, the interspaces being filled with slabs of stone. The English fan vaults of the middle ages are generally based on this structural principle.

C. SUPPORTS BEARING CEILINGS.

I. Columns.

a. General considerations.

In the course of our discussions we have reached a point, which must strongly attract our attention, one on whose solution more or less depends the soundness of our teachings, and which has busied the artistic fancy of all nations and of all periods in a peculiarly high degree, the treatment of columns, their capitals and bases. We cannot introduce and critically examine all the orders of columns in their entirety, that the architectural styles of the past produced, our problem is here only to seek for that generally valid point of view, that may lead us to the form treatment of the columnar order.

The ceilings required supports to receive the load and transfer its downward pressure to the solid foundations, the external walls and the partitions, as well as the columns and piers,

act as such supports. The load always appears very massive and bulky in comparison with the supports, and the idea of weight is always associated with that of bulk; to receive these masses, it is both appropriate and pleasing to enlarge the upper ends of the supports; the load must have a firm support and must be distributed over a large area of the foundation. Hence all architectural styles characterize by capitals the end of the supports receiving the load, and generally by bases the end transmitting the pressure to the firm substructure, these intermediate members not only fulfilling the known material purposes, but also characterizing the nature of the supports.

In case of round columns, their capitals and bases are chiefly transition forms so as to change the circular support into the square forms of the abacus and the plinth; they are very commonly fixed endings of limiting forms, and from the vertical position of the supports a distinction is required between the Above and the Beneath, as being ideas of space having unequal values. Therefore all nations have compared the capital to the head of the human form, and the base to its feet.

The differing functions of the upper end of the support, which supports the object in the air or a load, affording it a resting place suited to its form and dimensions, forming a transition to the support, were more or less clearly understood and expressed by different nations, as we found in the Chapter on Limiting Forms, since the idea of supporting something, of detaching it from the ground, is sometimes placed in the foreground, sometimes that of receiving a burden and of resisting the load, lastly sometimes the idea of the crowning of the upper end. As already stated, the lower end of the support was either not characterized at all, as if the support was stuck in the earth like a pile, or it was formed like a cushion or a seat, or even treated like the form of an animal on whose back stood the column. But the supports themselves were regarded as unyielding structural members, and were decorated by parallel vertical stripes; in memory of their original purpose, that of merely serving to support a light tent roof, they were sometimes represented as being wound with tapestries.

These general points of view in regard to the formation of supports were not only those guiding in past times, but are so

still, and will so remain for all future time. Still, they are modified in details according to the different nations, and the circuit of their lives, as well as in accordance with the problem to which they were applied, and the combination of the supports with other architectural details. The different functions of the columns, which restricted their forms within certain limits, are first to be carefully kept separate according to the principle of subordination, if one desires to review the multitude of different forms of columns, that have arisen in all parts of the world. To discover all the ideas which influenced the different peoples in the formation of supports is first of all, entirely impossible.

Why Egyptian columns have their definite form and no other, cannot be explained, but only this may be discerned, that the need clearly existed for characteristically distinguishing the upper from the lower end, that the leaves, stems and flowers of the lotus and papyrus, the symbols of the river Nile, were found suitable for covering the supports of a tent roof, and that the practice of winding tapestry about columns is a very ancient custom. The entire Egyptian architecture creates the impression that the entire building was conceived as an imitation of the tents of the nomadic hordes, which settled in various places in the then well wooded Egypt, and stuck the supports of their tents in the sand, and the naturalism in the treatment of the coloring permits the conjecture, that the idea of a support, whose capital should express the conflict with a burden, is not a primitive one, but is that of holding up something and of crowning the upper end, as being the head of the column, stand in the first rank in combination with the symbolic ideas not understood by us. That the Doric column has an internal alliance with the Egyptian can scarcely be contested in earnest, as it essentially differs only in the form of the echinus capital, where the idea of receiving the load of the entablature on a special support like a cushion, appears originally to have been expressed by pointed leaves, whose points were recurved downward. Whether this was actually the idea which the Doric capital was intended to personify, or another one unknown to us, can never be decided with absolute certainty. The forms of the row of leaves with recurved points,

which was not only employed as a supporting but also as a separating member in all Grecian architecture, and in imitation of this in Roman architecture, to formally connect to entirely different objects, appearing from their derivation to be modifications of primitive form elements, such as are likewise represented in the leafy crown of Egyptian capitals, and in the columns of Persia and of India, which remind one of fringed spear shafts. Should we desire to retain these forms of leaf bands for our purposes, it is not historical but practical and technical reasons by which their character will be determined, according as these forms correspond to the convex and concave profiled members, with their attracting, repelling or transition character as separating and supporting members, as band patterns with a decided prominence of direction, and as enclosing decorations.

A peculiar form of capital, which later found its fullest development in the Ionic capital, was introduced in western Asia; the form of a cushion appears to be the motive for all such forms of capitals, this cushion serving to raise the human form above the ground, and which according to its horizontal direction as well as to its upward and downward directions, supporting the entablature, sometimes assumes the form of a stool, a saddle or a sofa. If the original idea of support was originally identical with that of building up something (which it appears was already expressed in the word *Basileos*, king, which is from *Basis*, a support, and *Laios*, a stone slab, therefore meaning "standing on the stone"), raised above the others, elevated), the idea of generally employing the seat that supported the favored person, as a supporting architectural form, was thoroughly artistic, and one might go farther and conjecture that it was a people in the habit of riding, by whom this idea was expressed while those unaccustomed to the horse, employed the stone slab or abacus as a bearing member of the capital. Thus we may also see in the representations of vases the Ionic capital with a broad base directly employed as the seat of a figure, just as the form of the Doric capital was used in funerary monuments to support a figure, palm or acroteria.

However the form of the Ionic capital may have originated, its mode of origin, as well as that of the Doric capital, has

its mode of origin, as well as that of the Doric capital, has no significance for our architecture, since the circle of ideas of the ancient vases lies wholly outside the limits of human ideas in general, therefore of those generally valid.

The motive of the capital with two different forms of sides, which reached its highest form in the Ionic capital, will always remain indispensable to the architect, whenever two directions are to be made decidedly prominent in the horizontal plane; in such cases mediaeval architecture did not exclude the two-sided capital. But if one desires to employ the Ionic capital as the angle column of a building with porticos, which is not in accordance with its nature, he must seek a happier solution, than that found by the Greeks for similar buildings, as in case of the temple of Nike Apteros.

We can only designate such unskilful expedients as objectionable errors, as well as those for which the Romans have been so much blamed, and which have been so thoughtlessly imitated in our modern era, that are scarcely better than the aberrations in architectural forms permitted by the late Gothic and the late Renaissance.

As in the older Egyptian capital, the echinus of the Doric capital is merely an undeveloped bell; with it is allied the Corinthian, just as the Egyptian bell capital is to the latter; only the bell capital of the Egyptians is fully developed on all sides, since it has no proper abacus, the Corinthian supports the form of the abacus and is allied to this by its square plan (also if triangular or polygonal), since the most fully developed scrolls and leaves support the angles of the abacus. Two principal forms of flowers, the rosette and the palm, as well as the half developed buds, fill the intervals between leaves and stems, and form the terminal and dividing parts of the stronger branches, while the smaller branches are dispersed in a free play of lines. The Corinthian capital is no longer, like the Egyptian bell capital, a cluster of similar flowers and leaves bound together, but plant forms grow up around the bell in a manner, which betrays the thorough study of nature by the Greek sculptor; if the bell is largely visible as in the capital of the Tower of Winds, it is closely covered by a row of applied leaves, just as a shirt covers the body, or

the corolla of a flower conceals the stamens. A second row of leaves covers the lower ends of the first; if one row is composed of leaves with smooth edges like the inner row of the capital of the Tower of Winds, or the outer row of the Monument of Lysicrates, as a contrast to these the leaves of the second row are deeply serrate and have deep incisions or leaf eyes, such as are not only found on the acanthus but on many compositae (Onoropodon), for example the thistle, poppy and many umbelliferae (Heracleum) etc. It is very generally the case that no special plant form is imitated in the Corinthian capital, but it borrows special and characteristic parts from the plant world, develops these in accordance with the same laws of growth, as those of actual plants, and thus creates an ideal flora, whose foliage seeks those parts of the capital, which are geometrically most important, the ends of whose leaves and branches recurve in free growth, or roll up under the abacus, and whose flowers appear to strive for light just as flowers do in nature. All the separate parts of the completed Grecian Corinthian capital stand in the best relation to each other, but the Roman first ossified and became as if cast in a mould, naturistically swelled and yet dry (Acanthus leaves are never naturally treated in the Grecian capital, this being far from the Greeks, who only employed the typical and not the specific of plants in ornament. The only natural acanthus known to me is found in an early Gothic keystone in Regensburg).

The motive of the Corinthian capital has become so indispensable in architecture, that the middle ages not only used it sometimes, but also even so beautifully developed it, that in some examples it equals the Grecian capital. (Corinthian capitals from Arles; Schnaase, IV, 490; from Vézelay; Viollet-le-Duc, Dict. Rais. II, 503; from S. Madelaine at Chateaudun; the same; Entretiens, I, Fig. 24).

We may almost say of the Roman capitals, that whatever in them is good is not new, and whatever is new is not good. The changes made in Grecian architecture by the Romans were without any reference to the original meaning of the forms, with the exception of a conception entirely external, chiefly on practical grounds. The Doric capital is almost the only one in whose transformation an improvement is discerned, it has

indeed become one entirely distinct from the Grecian, and has cast off many peculiarities of the latter, thereby gaining in usability, especially in buildings composed of several stories, where the different orders of columns are arranged above each other.

The so-called Roman composite order, which was developed by combining forms from Ionic and Corinthian capitals for the sake of buildings in several stories and to enrich the repertoire of forms; may be justly cast into the historical discard and the gracefully decorated Corinthian capitals of the early Renaissance be employed in its place, which vary the motive of the Corinthian capital with a free play of form. The Tuscan order which the Florentines of the 15th and 16th centuries preferred to employ from local predilections, since they held it to be an invention of the ancient Tuscans, the Etruscans, according to the statements of Vitruvius, as well as for practical reasons because as the simplest order, it corresponded well with rusticated architecture, has its justification as a kind of simplified Doric order, or as being the lowest form of a complete order in the classic sense, if we may so speak, though skeptical about this, although opposed to all the precepts transmitted by Vitruvius and dutifully obeyed by the Renaissance, and we would not employ it merely because the ancients had done so, save only in case it suited our design on grounds of appropriateness and esthetic propriety. The rigid rules of Vitruvius and the whole hocuspocus of antique architectural forms, not only modules and parts, but also triglyphs and metopes, vases and drops, mutules and dentils, egg-and-dart mouldings and cymatiums, etc., belong in the historical discard, as soon as they no longer fulfil any real purpose, and their original sense is mostly unknown to us or does not correspond to our circle of ideas, and has no binding force for us.

Thus on the one hand we have saved sufficient of the classic columnar orders to not ignore them or be compelled to cast them entirely overboard, but on the other hand have sought to free ourselves from their traditional constraints.

No need here exists for troubling ourselves about the merely historically important form-ware of the treatment of the early Christian, Byzantine and Mohammedan capitals; only mediaeval

architecture can show new ideas in this direction, which are valueless to us. As stated in the Chapter on Transition Forms, it has preferred to accent the capitals, and the entire treatment of the capital as in the Corinthian preferably consists in decorative coverings of bell forms, in carving low reliefs or convex transition forms like the cushion capital of the Romanesque style, in a combination of both, a favorite feature of the Romanesque style, lastly during the late Gothic in transition forms of all kinds, in which the change from the round column to the square or polygonal abacus does not occur by a regular curve, but by means of various changes of section and modes of corbelling, forms both piquant and pleasing, which are especially justifiable when the purpose must be fulfilled by the simplest means, as in buildings for ordinary purposes, in iron architecture, etc.

Much may be learned from the study of the early Gothic bell capital, which is of value for the treatment of capitals in general, and equally so whether the foliage approximates the acanthus leaf forms or those of our northern flora.

This first completes the division of the masses, most suitable for working out the capital from the rough block, the development of many peculiarities in the foliage itself, based on a very careful observation of nature, the treatment of the bell to which the foliage is applied, and its connection with the abacus. The mediaeval capital is most completely adapted to vaulted construction in many respects, and the mode of its formation is better suited to the clustered pier than other forms of capital, and which is required to developed vaulted construction, while the antique forms of capitals correspond to the column as an individual thing, which by its nature can never be halved or quartered so as to be pleasing. Whenever the Renaissance masters have halved or quartered capitals or columns, by one-sided consistency or awkwardness or poverty of ideas, or even treated in the same way their substitutes, the caryatids, as in the late Renaissance, only monsters have resulted, the imitation of these forming one of the many monstrosities of our modern architecture.

The principal gain that we owe to the early Gothic in regard to the treatment of the capital consists in thereby being taught

to make the proportions of height and projection of the capital entirely independent of the diameter of the column, and to place the vaults in harmony with the mass of the pier and with their loads. The proportions of classic columns harmonize so perfectly with their entablatures, that essential variations therefrom are impossible without injury to the determinate character of the entire order.

Where the height is fixed by the harmony of the entire architecture, it is not possible to firmly adhere to the proportions of the classic orders without having recourse to the expedient of placing them on pedestals, or of being troubled by inconveniences of every kind. Only within the limits of the same architectural problems, which were presented to the classic architect, can the proportions of its orders be strictly retained, and the Renaissance masters have very often found themselves embarrassed in church architecture, not being able to free themselves from the constraint of the antique, but being compelled to arrange the plan to suit the arrangement of the columns, instead of the converse. In such cases one can only consult mediaeval architecture, to which the constraint of tradition was unknown, but which determined the proportions in accordance with the problem presented for solution, with an artistic feeling as sound as that of the Greeks.

The classic styles almost always striped the shaft of the column with flutes, which enhanced the impression of the rigidity and resistance of the column. These flutes were replaced by gilded stripes in case of columns composed of the nobler kinds of stone, those of metal or those placed in the interiors of apartments; from an esthetic point of view it is very disadvantageous to leave large and massive columns without flutes, since they appear rather heavy, though on the contrary this is well suited to small and slender columns. According to classic ideas columns always require to be diminished upward, both when standing free and when connected with each other.

An enlargement of the shaft is justifiable, as stated in the Chapter of Tectonics on the Forms of uniform Resistance to Pressure, if its own weight and its resistance to crushing must be considered; in the first case its lower diameter should be greatest; in the second the enlargement should be more nearly

at the middle of the shaft.

The massive Doric columns were formed according to the first principle as previously stated, but very tall Corinthian columns usually accord with the second. If very short and thick columns are employed to support massive vaults, whose ribs exert thrusts in many directions, a considerable enlargement of the column appears preferable to none at all. An enlargement is peculiarly justifiable and desirable in case of thin metallic columns exposed to crushing; on the other hand it is nonsense to enlarge columns that do not stand free but are grouped, as done in the late Renaissance and sometimes imitated through modern poverty of ideas. Enlarged pilasters do not belong in the historical discard, but in the museum of human nonsense, that requires to be still more roomy than the former. To this museum we shall likewise have to relegate one of the most favorite blunders, that of rusticated columns, where separate drums are treated as rusticated blocks, while their capitals and bases are fully developed. This nonsense, a favorite idea in even the best era of the Renaissance, is modified in various ways; either all the drums of the half columns are rusticated, when they appear as if incrustated with the deposits from a hot spring, or rusticated square blocks alternate with circular drums, as if the money had been spent in preparing the former, or the drums are all cylindrical, half of them retaining their rustication so as to interrupt the flutes of the column, appearing like rough bands placed around the column. No uncorrupted artistic feeling will deny that the Renaissance masters in the south as well as in the north well understood how to produce a magnificent effect with the means chosen by them, and to obtain good proportions of details and of the whole, which will always continue to be marvellous; but since one may patch up a poem from pompous phrases which remains nonsense, though pleasing to the ear, the worth of architecture lies not merely in its pleasing effect, but also mainly in the choice of means, with the use of motives for determinate purposes, and it must always be considered as being a complete wayt of architectural meaning, to combine architectural motives entirely at pleasure.

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like masonry; it may indeed be hung or would with tapestry as masonry may likewise be moved, and in this way all decorative covering of the column by painting or reliefs is justified; the shaft of the column should be divided into a lesser lower portion and a higher upper part by an intermediate member, either as in colonnades to avoid injuries to the flutes from the passage of men, the lower part of the shaft is left plain or an annular band is interposed, projecting beyond the lower part of the shaft, to make the lower third of the column appear thicker, or lastly to sharply separate the plain or decorated lower portion from the fluted upper part. But to treat a column as if composed of courses of stones is in complete opposition to a true artistic conception, which always considers the column as a unity, indeed composed of parts like the human form, but not produced by the combination of unities.

If we desire to increase the thickness of the wall by rectangular or semicircular projections, a problem very frequently attempted in the late Renaissance, and the treatment is to correspond to the construction of the wall, every reminiscence of the classic column is to be wholly cast aside, and a treatment of the capital is justifiable only in the sense of being a termination to these projections from the wall.

Finally, to treat the columns as twisted elements is always objectionable in architecture, only justifiable and possessing a meaning in art industry as well as in purely ornamental works, in which the supreme principle of weight passes into the background. On the other hand the fluting of the column loses its purpose and meaning in all works of the minor arts, to which also belong the shrines or cases with decorative and symbolic meaning, mentioned in the Chapter of Tectonics on Proportions, whose principal types retain the forms of actual buildings.

The motive of screw-like twisted forms corresponds, as we saw in Tectonics in regard to relative forms, to all combinations of tierods in opposition to parts subject to crushing, as well as to constructions of hollow tubes, which are partly perforated and partly entire, and employed for the most diverse purposes.

There still remains a word to be said in reference to caryatids, atlantes, hermes figures, and whatever else remains in

the service of architecture, from the more or less thoughtful works of classic sculpture, as well as of the mediaeval figure columns, etc.

Whoever uncritically admires everything done by the Greeks, and wonders at it purely because it was invented by them, will denounce as a heresy the mere question, whether the famous caryatide porch of the Erechtheum at Athens is altogether beautiful. Perhaps I may not be the only one, who would hold it to be a Barocco idea however beautiful the columns, if it had no symbolical meaning, and who would feel unpleasantly the execrable disproportion between it and the architecture. There is not merely a want of harmony between the animated figures in contrast with the stiff architecture that they support, but still more in the proportion of the supporting masses to that supported. Had the middle ages ever permitted a canopy to be similarly supported by statues of Christ and the twelve apostles, what a clamor would have been raised over such bad taste. But if we desire to retain the idea and to regard it as original, for the Greeks to employ figures as architectural members, we must still regard this freak as an exception, which acquires no higher value by repetition; besides we should not forget that caryatids and atlantes were used as if set in the pillory or in an even more debased sense, and in this is clearly indicated the limit of the permissible, in the introduction of human figures as architectural members; differently from free sculpture not in the service of architecture, a harmonic union of the plastic arts must be represented in connection with painting and architecture, and the use of the human form as a caricature is indeed justified as a substitute for architectural members if boldly treated; but the contradiction between the movement of human or animal forms and the rigid architectural structure can never be wholly effaced, if these are arranged in any sense other than that of being a decoration of the architecture. Figure decoration of all kinds is doubtless not only appropriate in architecture, but even desirable as being the highest means of ornamentation; but it should not replace architectural details. On the other hand these considerations entirely disappear in the minor arts, for the frequently stated reason that the principle of weight is not there predom-

predominant, which causes in the greater arts and in construction the appearance of rigidity of construction.

The Renaissance architects probably were only acquainted with caryatids and atlantes through Vitruvius, and they created miracles in architecture without the aid of these extreme artistic expedients; on the contrary our era deluges us with figures of sheet metal and plaster of paris, most of which have neither beauty, sense or meaning. These classic heroes and demigods are not to be condemned, but should be relegated to the only place to which they are suited, the realm of purely decorative art, the interiors of apartments, for humorous purposes, and lastly to the minor arts.

As we may have seen, the base of the column was considered a base stone, a cushion or a seat, to distribute the pressure of the column and its load over as large an area of the foundation as possible. Scarcely any other architectural form has become so firmly naturalized and found such wide acceptance as the Attic-Ionic base (Fig. 179). It has always been employed since the most flourishing Greek period until our era, although with many modifications, and the same decorative motive recurs in every style, that of treating its convex torus as a soft and yielding cushion, a row of leaves or a twisted rope, which appears to retain the foot of the column in place. The scotia that separates the two tori, if properly ornamented, is preferably ornamented by a row of slender leaves.

In the preceding we have briefly considered the treatment of the column according to the ideas of different nations, and in accordance with the problems to which it was applied, as well as its connection with other architectural members. We have to return to the point last named, as supplementary, before taking up the different kinds of columns. The problems for which columns are employed are generally works of architecture, art industry or the minor arts; the first requires the function of support to be strongly expressed, but in the two last this recedes behind other functions. The classic styles introduced in their orders not only different style tendencies but also tones, so to speak, which correspond to the character of a particular building as well as to its different stories, to that of manly strength and dignity in the Doric style, that

of grace and serenity in the Ionic, and of magnificence in the Corinthian.

In accordance with these tones the function of support is more or less strongly expressed in different kinds of columns, so that the character of the treatment of the general mass of a building passes from the grave to the graceful and then to the rich. The conception that the column is to support or elevate an object, the function of bearing then receding into the background, is most strongly expressed in the classic memorial columns and in the rows of columns placed before facades by the Roman and Renaissance architects, and which were crowned by statues, so that one might well say of these columns that they bore nothing; but to cast them aside for that reason would be to overlook one of their most important functions, and to forget that a large number of Grecian memorial columns would no less be condemned, than many works of Roman and Renaissance.

Memorial columns would likewise have a freer range of form for the reason that being monuments, the function of bearing falls into the background, and since the possibility of ascending to the top of the capital by a winding stairway becomes a principal aim, in a second degree a spiral arrangement of such a column would not only be sensible but indeed becomes requisite, as a ground motive of the manifold structural and decorative compositions that may be derived from it. The idea of a memorial column may thus be developed from the simple funereal monument to the formal tower through an inexhaustible series of possible solutions.

We shall treat of the column in connection with other architectural details in the Chapter discussing the arrangements of columns and piers in combination with entablatures and vaults.

b. Columns in detail.

In regard to the treatment of the separate parts of columns, especially of capitals and forms of shafts and bases, reflections of many kinds may be made on the hypothesis that the classic orders are not accepted as something consecrated by tradition and without criticism as we once did, but that the entire progress of architecture since the classic period, as well as that due to the middle ages and the Renaissance be taken as the starting point or basis of these considerations.

α. Form of the capital.

The most primitive treatment of the capital of the oldest styles already divided the capital into three parts, the bell, by which we understand in general the concave or convex principal portion of the capital, whether in the form of the Doric echinus or the Corinthian bell, the necking and the abacus. The principal portion of the Doric capital (Fig. 180) consists of the strongly projecting echinus, which well established name we retain as a distinction from other cymas, and this echinus is separated from the shaft of the column by several annulets, or rather the row of leaves painted on the echinus, and which only form a continuation of the flutes as it were, and is closely encircled by these annulets at its beginning like a collar. (Eötticher has made the number of the leaves equal to that of the flutes in his restoration of the painting of the Doric capital, so that as in the Egyptian compound capital the Doric capital and column become a bundle of separate plant stems bound together below the buds). The abacus is square and the circumference of the echinus is inscribed within it (Fig. 181). The breadth of the architrave exceeds the upper diameter of the column on which it rests, but is less than the width of the abacus, so that the latter and the echinus are in part not loaded. (Fig. 182). The architrave does not lie directly on the abacus but only apparently, since an imperceptibly raised central portion is left to receive the architrave, so that the angles of the capital are not loaded (Fig. 183).

Some capitals like those of the temple at Paestum have a second row of leaves beneath the neck bands, whose points are slightly recurved. If the architrave were laid directly on the abacus, the capital would be unsymmetrically loaded, and the excessively projecting angles of the abacus would run some risk of being broken off.

The Roman Doric capitals, which were perhaps imitated from late Grecian examples no longer existing, more freely represent the ground idea of the Grecian Doric archaic capital, retaining the adopted motive though without strictly adhering to its form, and vary the theme in manifold ways. the Renaissance followed this Roman mode of treatment, sometimes mixing forms resembling Ionic and Corinthian with the Doric.

The first essential alteration of the Doric capital by the Romans consisted in lessening its projection, giving to the architrave a breadth only equal to the upper diameter of the column; consequently the echinus became of smaller importance, so that its section approximated a quadrant, and the smaller projection of the capital required compensation in its increased height or that of its necking, so that the mass of the capital should not be diminished too much in proportion to the column. The neck was then separated from the shaft of the column by a bolder member, an astragal with a small fillet or a pearl bead, and was decorated by rosettes, palms, etc., and the abacus was ornamented by a row of leaves or a cyma. Besides the normal capital, two other very fine forms of capitals have remained to us, one from Pompeii and the other from the baths of Diocletian (Fig. 184); the necking of the first is a flat curve, while the cyma of the other is not formed like an echinus, but is composed of vertical leaves. Several kinds of capitals may be formed of a combination of forms taken from different capitals with the aid of two rows of leaves, which are suited to the most diverse problems by their greater or lesser height, but which lie within the limits of the motive established by the Roman Doric capital.

The Tuscan capital (Fig. 185) restored in accordance with the statements of Vitruvius is nothing more than a simplified Roman Doric form, just as the entire Tuscan order is merely a reduction of a classic columnar order to the most indispensable motives. This order was much used in the early Renaissance as better harmonizing with rusticated masonry, and in combination with that it is especially adapted to fortifications and engineering structures, city gates, barracks, and in general to massive structures for ordinary purposes.

The abacus of the Doric capital projects at its angles considerably beyond the echinus, so that its underside becomes visible; the Romans decorated this lower surface by recesses but thereby weakened the angles already in danger of breaking under the load. If the abacus were made octagonal these angles disappear, but the character of the capital is changed and it would appear compressed, only adapted to receive an impost of the same polygonal form. The angles of the abacus might be lessened

by making the diameter of the echinus equal to the side of the upper part of the abacus, but so profiling the edge of the abacus that its square under side would be circumscribed by the circumference of the echinus. The abacus then loses its meaning as a covering block and assumes the character of a peculiar support on which rests the load (Fig. 186); the underside of this support must then be octagonal passing from the octagon into a square form at top. All these forms of the abacus have their meaning, especially in case the capital is intended to receive vaults or arches, when a broad mass is placed on a proportionally thin support; this is especially true of iron architecture and of iron columns supporting vaults.

Finally one means for supporting the angles of the abacus consists in employing some decorative motive on the capital after the precedent of the Renaissance, to fill the space between the echinus and the angles of the abacus; the Renaissance used for this purpose small heads of animals and men, decorated the capital by dolphins or cornucopias, garlands of flowers or clasp-like volutes, etc., according to the use of the capital in structures more or less richly decorated.

Roman and Renaissance architecture almost always crowned the abacus by a row of small leaves (Pötticher calls this a lesbian cyma); the profile of the abacus is varied in different ways, (Fig. 187), according to the projection desired, which in this case results entirely from the geometrical construction of a circle with inscribed and circumscribed squares, in which it is desired to avoid a projection of the abacus beyond the echinus; the use of the capital for a special purpose, or the material in which it is executed will decide the choice of a profile for the abacus, since any particular profile gives to the capital a peculiar character.

The annulets that separate the echinus from the necking were either treated by Renaissance architects in accordance with the precedent of the capital from the theatre of Marcellus as simple fillets, or as beaded astragals, astragals with fillets, and even as a lesbian cyma by Scamozzi (Fig. 188).

The neck of the column may be straight or concave as already stated, or be changed into a second row of leaves like the capital from Paestum, or finally it may be left straight and dec-

decorated by rosettes or palm leaves; in Roman and Renaissance architecture it is almost always separated from the shaft of the column itself by an astragal and fillet, instead of which other mouldings may be introduced according to circumstances, a favorite idea in the middle ages (Fig. 189).

The idea of the Doric capital may be developed in the most diverse ways as we have proved, and the general ground laws concerning form and purpose, material and preparation, light and shade, etca, require these forms and their modifications.

The classic columnar orders were devised for post and lintel construction; when these were combined with vaulted construction by the Romans, a very troublesome inconvenience was caused thereby. If the columns were connected by an architrave and arches were thrown across above this, the architrave was not loaded and so became unnecessary; if it was omitted in the interior of a building but retained on the walls, the columns intended to receive the arches were either higher than those attached to the walls (Fig. 190), or the arch required to be stilted; both arrangements possessed unpleasing peculiarities.

Roman and Renaissance architects hit on a truly consistent though unmeaning expedient, that of placing above the capital a fragment of the architrave square in plan, or sometimes a part of the complete entablature with its frieze and cornice. Aside from the fact that such a block of the architrave or entablature is without meaning, when the column and the lower part of the vaults are viewed diagonally its mass appears ungraceful, heavy and unpleasing, and this impression becomes still more unpleasant if the capital is of the graceful Corinthian type. The Grecian Doric capital is the least ungraceful, its widely projecting and strong echinus supports very well a broad mass; but the severity of the Grecian Doric order is more decidedly opposed to the entablature block, than the more pliant forms of Roman architecture.

To load the imposts of arches and vaults directly on the capitals as sometimes done in early Christian architecture, and which modern architecture likewise allows, appears most unfavorably in case of free columns. The masses of the vault widening upward from the imposts require an energetic preparation, and both the classic and Renaissance styles know no other means

of obtaining this, than by the awkward entablature block.

Byzantine architecture made a virtue of necessity by inserting an inverted square pyramid of the desired height between the capital and the lower part of the vault, likewise making it very heavy in form. Yet in this ugly block never made beautiful by the richest decoration, a motive was introduced capable of being developed in another way; it is a support inserted between the capital and the vault, which can itself be entirely free from the forms of the architrave, and may receive a different form in accordance with the special problem in which the columns and arches are employed. According to whether the arch or vault requires a larger or smaller support between its lower portion and the capital, this support will consist of one or several layers, whose differences of section are to be arranged in accordance with the difference of the sections of the column and the impost, and the most pleasing proportion of the masses.

The support may be crowned by a row of leaves or a cymatium with the greatest propriety, and may be treated as a plain block, be flat, concave, with rosettes, ornaments, decorated necking, etc., or lastly be treated as a swelled cushion, and it can form the transition from the round column to the square impost block, in brief it may play the part of an intermediate support in the most varied way. (Fig. 191). Mediaeval architecture made the richest use of this stool-like intermediate support in accordance with the need of raising the base of the pier or column. Even the French and German Renaissance sometimes introduced this support, or employed the classic entablature block, changed by the omission of the architrave.

If a form of architrave remains on the walls of the interior, and also in other places, it is evident that the addition of this form of support is unnecessary; but it is always desirable to place the arches on the columns so as to connect the mass of the impost with that of the capital, and to have the support consist of a single low course of stone. The support cannot be omitted in case of coupled columns, but columns attached to and projecting from the wall need to retain their form of architrave in case the engaged column be not omitted, for there is an essential difference between a broken cornice and an entablature

block in the classic style. For clustered wall columns the broken cornice always has an effect as a mass, less unpleasant than the entablature block over detached columns; if the columns and capitals are entirely free from the walls, with a broken cornice seen in the most unpleasing way, i.e., viewed diagonally, the mass resting on the capital will still be less, than in case of a column standing entirely free on all sides; this mass may properly be lessened by not allowing the geison with its crown moulding or cyma to project more than is absolutely necessary at the places where the architrave and frieze are broken, while it may project elsewhere as much as may be required (Fig. 192); for its chief purpose is to protect the building from the rain water running downward, and its protection cannot be received by a column detached from the walls, unless the geison projects on all side like an umbrella, which would be very ugly. In drawing columns with the masses supported by them, it is absolutely necessary to represent the object from the most unfavorable point of view, or to draw a diagonal view in order to decide on the projections and divisions of the mass by the pleasing effect of the proportions to be obtained, as well as in all objects in which one form of section passes into another, for example a circle into a square; perspective drawing is not alone sufficient to give a proper idea of these proportions. This is especially true in case not only the effect of the mass, but also that of the outlines is to be considered, as in monuments, memorial columns, church towers, etc., since it then becomes necessary to draw a view parallel to the diagonal of the octagon *e f* (Fig. 193), as well as a front view *a b* and a diagonal one *c d*, in case a transition occurs from the square to the octagon.

The two-sided Ionic capital, whose mode of origin remains as obscure as that of the Grecian Doric in spite of all acute researches, differs in principle from the Roman Doric capital, strictly speaking, only in that the characteristic volute cushion is inserted between the abacus and the echinus. The proportions of the different parts are evidently different in the Ionic capital from those of the Roman Doric, and the individual motives likewise have forms differing from those of the latter, yet the ground ideas are the same with forms only approximately

similar. The prototype of both capitals appears to be traced to a column originating in the island of Samos, whose capital shows the Roman echinus decorated by leaves, but without the Ionic volutes. (Šhipiez. Hist. Crit. des Ordres Grecs, p. 266). The abacus of the Ionic capital merely consists of an Ionic cymatium (erroneously termed egg-and-dart moulding) or a lesb-ian cyma, the necking of the column is omitted or is decorated like that of the Roman Doric capital with palm leaves, rosettes and similar ornamental forms, according as the capital requires a lesser or greater height. The cushion is treated in various ways; these are referred first to the front view of the volutes with their eyes, then to the side view. The Roman and Renaissance architects really understood how to make the form of the Ionic capital beautiful, although one must admit, that the Renaissance strained every nerve at least to perfect the proportions of its Ionic capitals. The reason of this lies in the fact that neither the Roman nor the Renaissance masters were acquainted with the more perfect Grecian Ionic capitals. In the most beautiful Ionic capitals, for example those of the Propyleum at Eleusis, the cushion is highest at its middle, and its section diminishes toward the eyes of the volutes; its front surface is flat with an enclosing border.

On other capitals as in those at Eleusis, the flat surface is treated as a hollow, and on the capitals of the Erechtheum at Athens the entire cushion is treated like two bands placed over each other, and hollowed out on the front surface. The angles between the cushion and the Ionic cyma (egg-and-dart moulding) are sometimes filled by palm leaves. In the more beautiful capitals the volutes make but two complete spiral turns around the eye; in the doubled cushions of the Erechtheum a not very pleasing duplicate of the motive is produced by the double cushion. The capital from the temple of Apollo at Bassae is abnormal in a twofold sense, for it has cushions on all four sides, their centres being occupied by vertical palm leaves.

The later capitals were followed by the Roman and through by the Renaissance architects, and treat the cushion as a mere band with a border on its upper edge alone, no thicker at the middle than at the sides; the capital thereby becomes lower as a whole, which may be desirable in many cases, but the cush-

cushion loses its distinctive character.

On the contrary by treating the cushion as a double band, the turns of the volute having free scope, the volute as well as the entire capital becomes high, so that a necking becomes necessary to separate it from the shaft as in the Erechtheum at Athens. The Renaissance architects sometimes decorated the face of the capital by acanthus ornaments and gave the eyes the form of rosettes.

The facts here stated are evidently only reminiscences; the detailed treatment of the capitals must always in reality be based on a careful study of the classic columnar orders, and requires the most careful consideration of new ideas.

The side view of the cushion is always formed as if firmly bound together by a band, but the volutes are freely developed on both sides; several pearl beads sometimes accompany this band, as on the capitals of the Erechtheum, the side of the cushion is generally covered by scale-like lancet or acanthus leaves, or is even decorated by free scroll work. (Fig. 194).

One of the oldest Corinthian capitals with a double row of leaves, that of the tower of the winds, even has a square abacus; the later capitals as already stated sought to support the angles of the abacus by leaves or scrolls. The square abacus has too heavy an effect in proportion to the graceful foliage of the capital, and therefore a slightly curved form was given to that of the temple of Apollo at Miletus and elsewhere; but since very acute angles were produced by this curvature, easily broken off by the load, these were cut off so that the abacus formed a square in ground plan with curved sides (Fig. 195).

The centre flowers of palm leaves do not project in plan beyond the angles of the square, so as not to unnecessarily increase the dimensions of the block required. If the centre flower is to be covered by the abacus, its edge curves outward at both the angles and the centre (Fig. 196). These two forms of the abacus were first employed on the capitals of the monument of Lysicrates and on an ante capital from Eleusis. The profile of the Corinthian abacus remains a slightly or strongly coved slab in Grecian, Roman and Renaissance architecture, and is crowned by the Ionic cymatium; the astragal that separates the capital from the shaft remains in all these styles with the

form of a plain or beaded astragal connected with the shaft by a fillet and a transition form or cove. This abacus is sometimes decorated in the richer Roman examples by a running ornament or by vertical leaves, the so-called pipes.

As already stated, the Renaissance introduced a freer form of capital like Corinthian, which even more than that bears a purely decorative character, and that was transformed in the most varied ways to accord with the most manifold problems. Mediaeval architecture has done nothing in any way for the treatment of the capital on the Corinthian principle; it first separated the abacus from the capital in many cases, even for practical reasons, since the bell of the capital was the work of the sculptor, while the abacus was that of the stonecutter when not decorated; consequently the bell itself was finished by a slab, which was circular, square or concave, as in the abacus of the Corinthian capital already mentioned, according to the arrangement of the capital. The abacus placed above the bell block could then be square or be adapted to the impost of the arch, sometimes polygonal or circular, or it could take a form composed of polygonal, circular and rectangular elements. The mediaeval Corinthian capital also received a second innovation for practical reasons, which is worthy of imitation in many cases; in case it is not wrought from a single block, but is composed of two layers of stone, each of the two rows of leaves has its own bell slab, so that the lower bell does not appear so much dismembered as in many larger Corinthian classic capitals.

Gothic architecture frequently developed the abacus in accordance with the principle stated in the preceding, as a kind of support, whose base was set so far behind the greatest diameter of the capital as to avoid any projection of the support beyond the bell. In mediaeval vaulted construction, the angle leaves and buds of the capital appear less like organic parts of the capital bent downward by the load, or whose upward growth is hindered by the abacus, than as parts which indicate the direction of the ribs of the vault, even in the capital, or as light garlands, which seem to have sprung from the fully organized structural mass as a necessary expression of its nature.

Just as the Ionic capital accents two directions, mediaeval

architecture introduced the motive of grouped corbels to emphasize the direction, and which are supported by a separate capital or spring directly from the support, can bear an entablature or the springing block of several arches, and not only clearly indicate the directions but also lessen the spans (Fig. 198). The Renaissance afterwards took up this happy motive and sometimes treated it in the most graceful way in accordance with classic decorative principles. Heads, acanthus leaves and other forms borrowed from classic modillions may be applied to such corbel forms as ornaments, and decoratively personify their purpose.

3. Form of the shaft.

We can be explicit in regard to the detailed treatment of the shaft of the column; Doric columns always have intersecting flutes of flat curvature in section, terminated at top and bottom in any suitable way, while the flutes of Ionic and Corinthian columns are always separated by fillets and have semicircular or elliptical sections, and the latter sometimes end at top in a row of lightly recurved leaves. If the column is divided in its lower third, this is either done by a broad band, that appears to be connected to the shaft by small mouldings on its edges, or by a bold annular moulding; in the first case the projections of the small mouldings, whether astragals or pearl beads with fillets, should not extend beyond the lower diameter of the column, so as to be suited to the uncut blocks. On the other hand strongly projecting annular mouldings, favorite forms in mediaeval architecture, signify that the column is composed of three pieces, when they are wrought from separate blocks of stone. The profiles of such annular mouldings, which seem to personify a powerful swelling of the shaft by means of its own impulse and strength, may be formed in various ways, in accordance with the purpose, the material, the proportions and the decoration intended (Fig. 199); whatever the form of profile, height or character of lightness or heaviness, it is given to them depends on special circumstances, and also on the amount and quality of the decoration, which may be represented by a row of leaves or flowers, a rope wound around the column, a band set with semi-precious stones, or a band with heads or hooks for suspending garlands, etc.

A broad band wound around the column may be decorated by any

band pattern as an ornament in rich decorative works, and the shaft itself be covered by all kinds of ornaments in color or relief, scale-like, carvings like tapestry, network, scrolls or suspended ribbons, garlands and symbolical accessories, which conceal the nucleus of the column. According to the tendency of the free and rich ornamentation, we must always ask to the aid of the Renaissance, which was fruitful in an inexhaustible wealth of the most beautiful decorative ideas. Even the northern, French, Dutch and German Renaissance afford many specimens of beautifully decorated shafts of columns.

γ. Bases of columns.

The simplest form of the base of the column is that of the Tuscan order, which merely consists of a torus or of a base moulding instead of the torus, the plinth and a fillet with a cove, which forms the transition to the shaft (Fig. 200). The richer Attic-ionic and Corinthian bases have maintained themselves in the Renaissance as normal profiles after the Roman type and could now be scarcely displaced (Fig. 201). They fulfil their purpose as a base for the column in the best way, and are readily decorated by ornamental elements, which represent the fixedness of the column in its position, and the yielding quality of the cushion placed beneath it in the form of small mouldings, cushions and rows of leaves.

The true forms of Ionic bases from Asia Minor have scarcely any importance for northern architecture in their peculiar proportions and forms, but on the other hand different variations of the profile of the base have meaning and justification and may be developed partly by their simplification or enrichment, partly by increasing or diminishing their projections and heights (Fig. 202). These modifications of the profile of the base chiefly depend on the position of the eye of the observer, according to which columns placed high above the eye require a high base on account of their perspective foreshortening, and on the contrary the base may be low when viewed from above in the direction a (fig. 203) would appear quite differently from that seen from below in the direction b.

Just as the angles of the abacus of the Doric capital overhang the echinus, so as to produce danger of their being broken off by an unequal load, a vacant space remains between the low-

torus and the angles of the plinth in the normal classic base, so that one might fear the flushing of the angles. Mediaeval architecture filled these gaps in a thoroughly natural way by corner leaves, or sought to reduce them in various ways, either by hollowing out the upper edge of the plinth, by cutting off its angles, or by increasing the diameter of the lowest torus, so that its circumference became the circumscribed circle of the square plinth; or lastly by combinations of these different modes of arrangement, as well as by hollowing out the angles. (Figs. 204, 205). If the diameter of the torus exceeded that of the plinth, the overhanging torus required support, which was furnished by a small corbel or an ornament. All these detail motives introduced into the forms of the base by mediaeval architecture, at least in part, may well be clothed by the forms of the Renaissance. A peculiar treatment of the bases of columns corresponding to the capitals composed of forms placed diagonally in combination with others, whose changes of section do not occur gradually, but suddenly, was a great favorite in later mediaeval architecture and thereby created a motive, which may be employed in many cases, very suitable for casting metal, iron architecture and wood carving.

5. Pedestal of the column.

Roman architecture and following it the Renaissance felt a natural necessity of introducing other features in addition to the normal ones of the orders, which should be more perfectly adapted to the treatment of buildings in several stories; if one desired to place one order above another, the great projection of the lower entablature concealed the bases of the columns placed on it. Perhaps the windows that were introduced required a fixed height of the wall between them and the cornice; to make the base of the column visible, it could be placed on a separate pedestal of the same height as the window sill (Fig. 206). But this with its cap must now find room between the base and the top of the cornice in accordance with the tolerably normal proportions of the orders, which varied within certain limits, the diameter of the column, its height, etc., were the dimensions fixed in advance, the scale of the upper story was entirely determinate, on which those of the lower stories were dependent with their heavier orders. This scale of the lower story made necessary the insertion of a pedestal under its

columns, which would otherwise have borne false proportions. Peculiar forms of pedestals were in this way developed for the orders, which require consideration in detail. The height of these pedestals amounts to perhaps $1/9$ to $1/5$ that of the entire story, or about $1/3$ that of the column with its capital and base; the breadth of the pedestal, which supports the base of the column, should not be much less than that of the plinth of the base, since this would appear otherwise as not sufficiently supported, that is always disagreeable.

The simplest form of pedestal consists of a die, cap and projecting base; the cap may be connected with the die by supporting and transition mouldings, according to the purpose for which the pedestal is employed, and in accordance with the richness of the architecture, and the die may likewise be connected with the base by an architrave (Fig. 207).

The Renaissance masters kept their orders strictly separate, and gave these simple forms to the pedestals of the Tuscan columns, more richly profiled cap and base to the Doric, still richer ones sometimes decorated to the Ionic and Corinthian, in accordance with the precedents of classic pedestals (Figs. 208, 208a); a separate necking was also sometimes used as by Vignola. As a rule the band is the principal member of the cap, though this is sometimes the transition member (cyma, corona) as on the arch of Constantine and that of Severus.

The richest form of pedestal was invented for the so-called Composite order produced by a combination of Ionic and Corinthian. Although the Composite capital as being a monster has no importance for us, and the essential differences between the entablatures of the Corinthian and Composite orders consist only in the use of both modillions and dentils, which after all is not great, we shall not be afraid to borrow the richer forms of the Composite pedestal when they have any value to us. (Fig. 209)

Pedestals have an importance as a basis for free standing monuments on which something is to be placed, even greater than for columns. They then become columns or supports bearing an object in the air, and from that point of view both the classic and Renaissance styles employed pedestals for columns, and furnished them with bases and crowning caps. We shall hereafter consider the pedestal of a monument by itself.

In massive arrangements of piers, such as are required by vaulted structures, especially in mediaeval church construction, the bases of clustered piers and columns should be treated as massive base blocks, which with a gradual increase in width, distribute the pressure of the pier over the foundation. The offsets of the courses should be softened by any transition forms; the lower course could sometimes be shaped as a bench for a seat (Fig. 210); where such a seat is useful and justifiable, it affords the best means for giving the pedestal a broad base.

2. The Pier.

Generally by the word pier are understood so many different things, that it is scarcely possible to give an exact definition of the conception; therefore we shall here only apply the term to those vertical supports which are not columns, both detached and connected to walls.

α. Treatment of the pier in the Classic and Renaissance Orders.

Piers in architecture always have this in common with columns, that of being intended to support a load in the air, and to transmit the pressure to the foundation; like columns they require a base slab, base, abacus and capital. As in case of columns, capitals and bases have the function of forming a transition between the form of the pier and those of the load and the foundation; but since the section of the pier is almost invariably formed with reference to the architectural details nearest it, the formation of the bases and capitals of the piers is simplified.

The classic orders were generally only concerned with square detached or compound piers. The Grecian Doric style gave wall piers an abacus supported by a Doric and half recurved row of leaves (cymatium) and finished at top by a small crowning moulding; the cymatium (hawkstail moulding) was connected with the pier by a necking or a few bands, or exceptionally by an Ionic cyma supported by a pearl bead (Fig. 211), as on the temple of Nemesis at Rhamnus. The base consisted of a simple projecting plinth or a reversed base moulding. Small modifications in the forms of these capitals evidently occur in the few examples remaining, and each individual case is designed in harmony with

the entire building in which it is found.

The pier caps of the Tuscan order of the Renaissance masters are partly very simple as in Vignola, partly richer and so profiled that the crown moulding becomes predominant (Fig. 212). The Roman and Renaissance styles profiled the Doric pier capitals in very similar ways, but usually left the base entirely simple, which consisted of a single offset with or without a transition moulding.

The Grecian Ionic order invented two characteristic forms of anta capitals in the most important examples remaining from the Erechtheum at Athens and the temple on the Illissus at the same place; further in the Propyleum at the temple of Minerva Polias at Priene, as well as in the temple of Apollo Didymaeus at Miletus. The two first consist of a bead and necking between which were inserted an Ionic cyma with above this a lesbic cyma with a pearl bead (Fig. 213). The necking was decorated by palm leaves, and in the first case was separated from the shaft by a small pearl bead. The two last are the so-called canopy capitals (Mauch. Arch. Ord. Pls. 11, 12), but to approve their form as well as their unquiet decorations, one must be a blind enthusiast for Grecian antiquity. The Grecian Ionic style forms the base of the pier like that of the column.

The Roman Ionic style, and in connection with it the Renaissance treats the capitals of piers as richly moulded abacuses, with almost entire independence from the Greek conception, or as a capital decorated by foliage. What now remains of Roman architecture in general possesses so little authority over detail, that a great number of these heaped mouldings of caps have little value to us, and we can more nearly follow the Renaissance, which took the greatest pains to restore the ideal of Roman architecture with whose decadence it was principally acquainted (Fig. 214).

Two versions of pier capitals of the Grecian Corinthian style are known to us as in case of the Ionic, the pier caps from the tower of the winds at Athens and two beautiful capitals from the entrance hall at Eleusis and from Paestum; both have decorations of foliage and figures. (Mauch. Arch. Ord. Pls. 13, 15).

The Romans almost wholly employed only the Corinthian bell capital with acanthus foliage, which was adapted to the rectangular section of the pier; the Renaissance masters used similar

forms, or impost capitals in case of piers supporting arches, which differ little from those of their Ionic or Composite order, chiefly in possessing a richer ornamental decoration than that of the latter (Figs. 215, 216).

The bases of small piers such as window pilasters or those employed near canopied niches, were more simply formed in Roman and Renaissance architecture according to circumstances, and the mouldings were reduced to their possible minimum, or on the one hand if the decorative treatment was refined in accordance with the material used (marble, bronze) and the position of the little piers or columns, the surfaces of the pilasters were decorated by delicate ornamental work or inlaid work, small columns were even treated as graceful candelabra, which is entirely justifiable and especially in decorative works. The forms of such minor architecture are of importance in the composition of monuments proper, reredoses and similar articles of furniture related to the domain of architecture proper, as well as actual furniture. In art works on the other hand, according to the principle firmly retained throughout our entire discussion, in general only the typical in architectural forms possesses meaning, while the detail forms require transformation and a finer treatment, corresponding to the purpose of the furniture and other articles.

3. Formation of compound piers according to the classic plan

According to the plan of an interior, a series of modes of forming groups of piers result, which may be referred to a few ground motives:- 1, two or more piers form a group of elements of equal height; 2, they form a group of elements of unequal height (Fig. 217). In both cases the following ground motives result in practice:- a, two piers stand beside each other; b, two piers make a right, acute or obtuse angle with each other; c, several piers compose a group. These problems occur on facades as well as in interiors, in post and lintel as in arched construction.

If several piers are connected in a group of determinate height, each one either requires its separate capital and base, and the piers may then be detached from the wall, which affords sufficient space for the free development of the capitals and bases, a common plinth and abacus may also be added to these;

or the capitals and bases grow together and form a compound capital and a compound base, in which reentrant or projecting angles sometimes require transition ornaments to fill the angles, so that the group really forms a whole, and does not appear merely as an external combination.

Transverse connections are not only proper, but are necessary in many cases in compound piers at about one third or one half their height, in order to properly bond together the different courses of stone, each composed of several pieces; this is especially true of brick piers where a bond stone must be inserted occasionally. One of the finest examples of transverse connections is found at the angles of the court of the Cancellaria at Rome. If the piers of a group are of unequal height, two cases become possible, the capitals and bases of the projecting portion extend around the other (Fig. 218 a); or the pier caps and bases of the receding portion die against the projection a. The projections of the cap and the projection of the pier must be so arranged, that this dieing of the mouldings is possible (Fig. 219). Since the cap of the lower pier must be included within the solid of the projecting one, the cap of the former may extend entirely through the pier as a course of stone, breaking the projecting portion as a band. But this band may remain plain; or the lower mouldings may be broken around the central pier, supporting a smooth projecting band, against which the upper mouldings die; or the upper mouldings may extend through and only the lower ones die against the central pier; or lastly the entire cap moulding may be broken around the central pier (Fig. 220). If capitals are found at three different heights in a compound pier, one should take care that the cap of the lower pier dies against the projection of the highest one (Fig. 221), and the courses which correspond to these capitals could only break the higher pier as smooth bands in this case; any other arrangement would have an effect more or less disturbing.

Compound piers may cause the disadvantage of occupying more space as well as obstructing the view, and of hindering the passage of light into the room. The separate piers may therefore be in part replaced by columns (Fig. 217 a). This causes many difficulties; one must first decide whether he will strictly

adhere to the principle of considering the column only as a unit, therefore never employing it as a quarter, half or three quarter column, nor whether these shall be used. If it is decided to substitute columns for piers, that never require a fixed ratio of height to width, one is always fettered by proportions to a certain degree, and if he refuses to make the ratio of height independent by placing pedestals beneath the columns, it may occur that the columns will appear too slender in comparison with the remainder of the pier not replaced by columns. If different heights in the compound pier are to be taken into account, another proportion of the column must be suited, and it would be very difficult to obtain a harmony of all parts. These and other difficulties that especially occur in church construction, will not be diminished but even increased by the use of half columns, formed according to the classic model, and one can only avoid them all by emancipating himself from the classic orders and strengthening the pier by semicircular projections, which are entirely independent of all classic proportions and are provided with capitals especially composed for each case (Fig. 222). In this way is found the mode of formation of piers employed in mediaeval vaulted construction, one tendency of which was begun in the cathedral of Autun and never received any farther development; or was brought to a consistent issue, although a kind of Renaissance was created in it, which is as far removed from the coercion of the classic as from that of mediaeval architecture, or from Gothic, the most extreme phase of its development.

γ. Compound piers according to the mediaeval plan.

The question arises how the problem of mediaeval vaulted construction may be solved by a treatment of the piers, that may retain whatever is worthy to be retained, of the forms of classic architecture and in the spirit of the Renaissance, but which is freed from the restraint of the classic orders, so far as their rules cannot now satisfy purposes for which they were not intended. Take the general case of a space to be divided by piers, each bay of the plan to be covered by a groin vault, with the further condition that the pier must occupy as little space as possible, the ribs and arches of the vaults to be entirely separate at the imposts and not intersecting;

if we support the side arches by semicircular projections, the total width of the piers will not be less, than if these projections were rectangular; the supports of the ribs would appear too massive in proportion to the ribs if rectangular, when viewed diagonally, for the moulded ribs would then recede back of the supporting pier. Therefore we can make the projections rectangular under the side arches and round under the ribs, thereby obtaining arrangements allied in form to the transition style, the more readily if we make the crowns of the arches of approximately equal heights, which requires different heights for the springing points of the supports. The rectangular pier should be treated similarly to classic pilasters, but the semicircular piers supporting the ribs are not considered as being classic columns, since their proportions are entirely independent from those of columns; they are and remain round piers or vaulting shafts, to use the striking expression of the middle ages.

It is here sufficient here to have indicated in what way the mediaeval form of pier may be adapted to one allied to the classical type and conversely; this is not the place to go onto separate questions concerning the treatment of the pier, which results from mediaeval vaulted construction; whoever fully understands mediaeval architecture will easily find his way in accordance with what is given here, to compare mediaeval and Renaissance modes of treating the pier. There only remains for consideration the problem of reducing the section of the pier to occupy the least possible space and not obstruct the light.

If the pier, or rather the section of its load, be arranged symmetrically about two axes, it may be replaced by a simple cylindrical column, if its capital be so formed as to afford a proper support for each separate arch. If the symmetry exists only about a single axis, the support may be a pair of equal or unequal coupled columns, or may consist of a group of round columns, according to circumstances (Fig. 224), in which case it must be remembered, that in most cases it is very difficult to transmit a uniform pressure, or one proportional to the sectional areas of the different columns, and that generally but one column really supports the load, the other being slightly loaded or not at all. Round pillars neither require to be swelled,

diminished, nor fluted, as they are not columns in the sense of classic columns of fixed proportions, but are rather circular wall masses, if one may so speak. In all forms of piers cited heretofore, we have assumed that the side arches and ribs are separated above the capital, so that the section of the impost block is not composed of arch and rib sections intersecting each other. The reduction of the section of the pier to its minimum depends on the formation of the impost stone, neglecting the strength of the materials employed for the pier, and the permanent crushing load on the pier. While the mode of executing a refined and complex piece of stonecutting was not yet understood, the ribs and arches were necessarily separated from each other above the impost cap of the pier. In the best Gothic period it first became known, how to allow the arches to intersect at their lower ends, to require the least possible area on their support. Then three cases became possible, either the extreme outer points of the ribs and arches were equidistant from the axis of the pier, or the arches or else the ribs projected more than the other members (Fig. 225).

The simplest arrangement in both appearance and execution is that in which the ribs and arches unite above the impost and form a polygonal impost (Fig. 226), which shows the section b reduced to its minimum. If the ribs are smaller than the arches, the polygon has alternately equal sides c, and since each stone above the impost is to be wrought from a rough square block, to save material it is preferable to keep the number of courses of stone between the impost and the first voussoirs of the ribs and arches as small as possible, and to allow the ribs to project so far from the axis of the pier, that their sections may completely fill the upper square a b c d of the rough block a b c d e f g h (Fig. 227); in this case the cap stone of the pier will be square. If it is desired to have the ribs and arches project as little as possible, to reduce the support to the absolute minimum, they should spring from a square capital as in Fig. 228); but if we wish to separately develop the arches, reducing only the ribs, the abacus of the capital might be square (Fig. 229). To place the most distant parts of the ribs farther from the axis of the pier than those of the arches, would be incorrect; not forgetting the case when the ribs and

arches have equal radii and equal heights of imposts and crowns in a vault on a square plan. A peculiar form of vaulted construction would then be developed with very high sections of ribs, cross-shaped and strongly projecting capitals that should be treated as corbels if they are to be placed on small supports; such constructions are suitable for mixed iron and stone construction.

3. Entablatures of Stone, Wood or Iron.

α. Treatment of entablatures.

The most important points concerning beams of wood and stone have been stated in connection with the treatment of ceilings, yet these have been given with special reference to interiors, less to the development of entablatures on the exterior and serving to connect supports, either columns or pilasters.

The bearing capacity of entablatures increases in proportion to the square of their depths and in direct proportion to their widths, as well known; the spans of intercolumniations then depends on the sectional area of the entablature, but evidently chiefly on its resistance to transverse stress for the material employed.

Classic styles treated the architrave as a simple beam with a projecting margin (Fig. 230), or it was composed of two or three courses lying on each other and crowned by a cymatium, the courses being separated by richer arrangements of pearl beads or smaller cymas. The underside of the architrave remained smooth and was decorated by painted band patterns, but in Roman buildings it was generally ornamented by sunk panels or by relief bands (Fig. 231) (Mauch, Arch. Ord. Pl. 62), the latter being commonly enclosed by cymas and pearl beads.

If the lower side of the architrave appeared too broad, its centre was decorated by a moulded or ornamental band, and it was so divided in two halves (Fig. 232). When the architrave was composed of two beams placed side by side, the under edge of each could be decorated by a simple sunk or ornamental panel, or these moulded sinkings could be arranged symmetrically about the central joint (Fig. 233).

Wooden beams have been treated with exhaustive fullness in the consideration of the construction of ceilings, and it only remains to briefly mention trussed beams or girders, which play

an important part in bridge construction; whether of wood or iron, lattice, suspension, or girders supported by piers, their nature consists in this, that the bearing upper and lower members are connected by stiffening members, and are so fastened together, that the girder becomes an inflexible whole like a roof truss. What was said of visible wooden and iron roof construction therefore applies to the construction of girders, but especially the frequently repeated general law, that in engineering construction on a large scale, the tectonic solution of the problem is to be sought in the plainest and clearest construction, and not in the paltry treatment of details. The recognition of the external appearance of a perfected construction, as being esthetically valuable, is more important than any attempt to conceal the construction by covering the structural forms by decorations in thin metal or boards. In the course of the entire discussion, we have already spoken as occasion offered, of the general peculiarities that may come into consideration in the construction of bridges of iron or wood, so that scarcely anything new remains to be said of the treatment of the girders; they should be regarded as being resolved into their parts, which will then receive examination elsewhere in relation to principles and in connection with other things.

3. Entablature in connection with the classic orders.

Classic architecture based the proportions of the intercolumniations and their heights on the lower diameter of the columns, and fixed certain normal proportions that were more or less binding. Such normal ratios can evidently possess but a limited value; for the distance in the clear between the upper ends of the columns, or rather the actual span of the architrave, chiefly depends on the resistance of its material to transverse stress. Easily fractured stone required the columns to be set closely, and on the contrary tough stone permitted them to be spaced widely. Since the classic columns had normal proportions of height to a certain degree, the Doric order could have relatively wide intercolumniations if low, but must have narrow ones if with very tall columns; for if the extreme allowable span of a stone beam is fixed at about 20 ft., the height of the order would depend on this span only within certain limits, and the character of the entire order might change without al-

altering the actual span of the architrave.

Ionic and Corinthian orders as well as those with pedestals, always appear to have relatively narrow intercolumniations, since their height is great in proportion to the lower diameters of the columns. An old French edition of Vignola's Orders gives the following practical proportions, which may properly be taken as normal:-

Let D (Fig. 234) = lower diameter and H = height of the column; w , w' , w'' = distances between their axes; H' = total height with architrave, frieze and cornice; then approximately;

	H	w	w'	w''	H'
Tuscan order,	7 D	1.5 D	3 D	4 D	9 D
Another examp.	7.5 D	1 $\frac{2}{3}$ D	3 $\frac{1}{3}$ D	4 $\frac{1}{2}$ D	9 $\frac{1}{3}$ D
Roman Doric	8 D	2 D	3 $\frac{1}{3}$ D	4 $\frac{1}{2}$ D	9 $\frac{3}{4}$ D
Roman Ionic	9 D	1 $\frac{2}{3}$ D	4 D	5 $\frac{2}{3}$ D	11 D
Roman Corinth.	9 $\frac{1}{2}$ D	2 D	4 D	5 $\frac{1}{2}$ D	11 $\frac{1}{2}$ D

These proportions only give starting points, correct only in a general way, so as not to approach too closely certain limits, which may not be exceeded in usual cases if good proportions of the orders are desired. If the architrave is to be supported by arches (Fig. 235) the spans may be greater; the work just mentioned gives the following normal proportions for this case.

	H	w	w'	H'	w''	w'''
Tuscan order	7 D	2 D	5 D	8 $\frac{2}{3}$ D	7 D	3 $\frac{1}{2}$ D
Another examp.	7 $\frac{1}{3}$ D	1 $\frac{3}{4}$ D	5 $\frac{1}{4}$ D	9 $\frac{1}{4}$ D	7 D	3 $\frac{1}{2}$ D
Roman Doric	8 D	1 $\frac{3}{4}$ D	5 $\frac{2}{3}$ D	10 D	8 D	4 D
Roman Ionic	9 D	1 $\frac{3}{4}$ D	6 D	11 D	7 $\frac{1}{2}$ D	4 $\frac{1}{2}$ D
Roman Corinth.	10 D	6 $\frac{1}{2}$ D	6 $\frac{1}{2}$ D	12 $\frac{1}{4}$ D	6 $\frac{1}{2}$ D	4 $\frac{1}{2}$ D

For orders with pedestals (Fig. 236), letting P = height of pedestal; H = height of column; H' = total height, other notation remaining as before, the same book gives the following normal proportions for this case:-

	P	H	H'	w	w'	w''	w'''
Tusc. ord.	2 $\frac{1}{3}$ D	7 D	11 D	1 $\frac{3}{4}$ D	6 $\frac{1}{2}$ D	8 D	4 $\frac{1}{2}$ D
Anoth.ex.	2 $\frac{1}{2}$ D	7.5 D	11 $\frac{3}{4}$ D	1 $\frac{3}{4}$ D	6 $\frac{3}{4}$ D	8 $\frac{1}{2}$ D	4 $\frac{3}{4}$ D
Rom.Doric	2 $\frac{2}{3}$ D	8 D	12 $\frac{3}{4}$ D	2 $\frac{1}{2}$ D	7 D	9 $\frac{3}{4}$ D	5 $\frac{3}{4}$ D
Rom.Ionic	3 D	9 $\frac{1}{3}$ D	14 $\frac{1}{2}$ D	1 $\frac{1}{2}$ D	7 $\frac{3}{4}$ D	9 $\frac{1}{3}$ D	6 D
Rom. Cor.	3 $\frac{1}{3}$ D	10 D	15 $\frac{1}{3}$ D	2 D	8 D	9 $\frac{3}{4}$ D	6 D

Y. Arrangement of piers and architraves in girder bridges.

The piers of most girder bridges and of similar structures are usually strong wooden trestles or masses of masonry, or more rarely are iron structures, which serve as the abutments of the bridge girders. According to their arrangements they are either end or intermediate piers. They consist of a base, the pier itself, and the cap or coping for receiving the bridge girder, according to whether they serve as piers of bridges leading across a river, or as those of viaducts or aqueducts.

Under all circumstances the base serves as a firm and broad foundation for the entire structure, and bridges over rivers or arms of the sea must be constructed with reference to the

highest and lowest water levels, to high water as well as to the ebb and flow of tides, it serves as a wave and ice breaker, ~~ships are not allowed to anchor near the pier~~ and as such has its peculiar form corresponding to the material purpose, and may be provided with a coping or crowning course, or be prepared to receive the body of the pier by means of any suitable transition form; the entire pier is diminished upward, partly to save material, partly to less obstruct the passage of water, and also in many cases to avoid loading the foundation too heavily, besides it always looks better than if it were not diminished. The transition from the base to the body of the pier with its projections at both sides and ends, permits the most varied changes of section, that exert an essential influence on the pleasing form of the bridge pier. The architects of the middle ages fully understood how to effectively treat these projections, which served to break the force of the waves, sometimes erecting chapels on them, sometimes furnishing them with platforms or balconies, accessible only by means of steps, from which aid could be given to sailors or logs could be prevented from striking the pier.

The base of the pier and its projecting ends were not constructed with sole reference to a pleasing effect, but to break the waves, to admit of the use of the plainest rough and rock-faced ashlar, and the strongest mode of anchoring the stones by means of iron cramps; when such pier heads were protected by ironwork, they have a fine effect.

The body of the pier is lacking in many cases, the girder being placed directly on the substructure, which is then crowned

by battlements, by a tower, a pedestal supporting a statue or group of statues, a through pier serving to conceal the junction of the ends of two girders, the body of the pier sometimes rises from its base leaving a bold offset to serve as abutment for the struts of a wooden abutment bridge (Fig. 237).

The coping under the girder serves both as a block for its support and as a cap for the pier. For the first purpose, it should have a strong projection where it receives the girder; for the latter it must have a bold cornice (Fig. 238), which may be profiled in various ways according to the character and arrangement of the bridge, whether it is to be in a city or in the country, connected with fortifications or be a simple viaduct or aqueduct, be in a park or in a narrow and rocky valley, in accordance with which it should make a more or less pleasing impression corresponding to the locality and its purpose, or be more or less robust or graceful.

The corbelling at the top of the pier, angle projections, tower-like additions, towers and other moderately effective structural motives for developing the bridge pier architecturally, should be employed wherever possible in order to make a real architectural work of the simplest and most economical problem of bridge construction.

Reference must once more be made to the general considerations on the problems of engineering, where anticipating this opportunity, we suggested an esthetic expedient for treating lattice bridges, the least pleasing of all bridges, so that their parts might be in harmony with each other, and the whole be suited to the surrounding landscape.

The abutments at the ends of the bridge might have a richer and more pleasing treatment by using known architectural motives, than is usually accorded to them. Generally they are merely terminating masses of masonry, which resist the pressure of earth like retaining walls, and whose external appearance is principally dependent on the choice of the kind of masonry. A special emphasis should be laid on a transition between the abutment and the girder so much the more, because the unpleasant junction of the girder and pier is generally neglected. Hence the so-called corbellings are valuable esthetic expedients, and the hardness of the junction of the horizontal and

vertical lines of the end of the bridge should be broken by flights of stairs (Fig. 140), pendentive vaults in the angles with the shore walls (Fig. 241), angle towers (Fig. 242), buttresses and similar architectural motives. This hardness disappears in arched bridges, whether built of masonry or merely of bridge girders of curved form.

4. Arches above Piers and Columns.

a. General.

Fixed rules cannot be given for the proportions of arcades without regard to their purpose, for which they are employed; the effect of the arch will be the more powerful, the greater its radius, and the smaller the height of its support (Fig. 243), it will appear to be heavily loaded and weak if the arch be too thin, lightly loaded and clumsy if it be too deep. (Figs. 244, 245). The form of the arch has for us something peculiarly characteristic through associated ideas, segmental and elliptical arches of low rise seem to be depressed (Fig. 246), and this character of depression corresponds in the fullest degree to the arrangement, where the supports of the arch are low, as in low halls and bridges; it is more or less opposed to designs for rooms of considerable height and to spans on high supports; the depressed arch, whether segmental or elliptical, only looks well as a discharging arch, when the arch merely serves its purpose without raising the question of making a pleasing appearance (Fig. 247). Its stability is increased and its appearance becomes more pleasing, if its depth be increased toward the abutments (Fig. 248). The elliptical arch of low rise is fully justified when constructed in a small span between abutments which serve as corbels (Fig. 249). The abutments may then be replaced by supports or corbels of different forms, which likewise support the elliptical arch (Fig. 250). In many cases the broken segmental arch may be used (Fig. 251), but it is strictly only a pointed arch, in others the broken oval arch may have a very elegant effect, since it surpasses the segmental and elliptical arches in pleasing effect, for example if its rise = $1\frac{1}{3}$ its span or $1\frac{1}{2}$ if its curvature be as regular as possible.

The semicircular arch always appears pleasing, if its lower ends are not concealed by a projecting impost cornice; it suits

any proportion between its span and the height of its supports; it may spring directly from a base, so that its piers are omitted, or it may be placed on very high supports without producing a disturbing effect, although a pointed arch is more pleasing in the last case, it may be strongly stilted if necessary; in brief it is better suited to all circumstances than is any other form of section.

The pointed arch is least adapted to the arrangement in which the vertical direction is to be specially accented. Various structural methods of determining the radius of the pointed arch were known in the middle ages. 1, the radius = $2/3, 3/4, 4/5 = \frac{n+1}{n} \times \text{span}$ (Fig. 252). 2, the radius = hypotenuse of a triangle with sides to each other as 1 : 1, 1 : 2, 1 : 3 = 1 : n. 3, the centres of the arch are found by projecting the angles of the polygon on a diagonal (Fig. 253). 4, the centres are found on a diagonal of the polygon, so that the pointed arch passes through two or three angles of the polygon (Fig. 254). All these methods of construction have a single purpose, that of aiding the enlargement of the pointed arch to full size and of obtaining exact work in stonecutting; some of them possessed peculiar advantages in the construction of forms of tracery, while others were pure trifles. It would be well in practice to determine the centres of the parts of the arch, both pointed or oval, by any fixed rule so as to lessen the labor of drawing them full size. Compare the constructions (Fig. 254 a). All kinds of combined arch forms (Fig. 255) like those preferred in mediaeval and moslem architecture, in the Dutch Renaissance, and especially those composed of concave and convex curvatures, have not a structural but merely a decorative value, and should therefore be excluded from structural designs as much as possible, being relegated to the domain of decoration, where they are certainly justifiable. For example, small doors or windows, cellar openings, narrow openings in walls, which are covered by a single stone, also small canopies or the coverings of small niches in walls, may well be finished in arch forms combined in the most various ways, while the same forms would not be structural if used on a large scale, and should be avoided for that reason.

The segmental arch requires an increased depth toward the

abutments to increase its stability under a greater load; on the contrary the pointed arch requires this increase toward its crown (Fig. 256). To a knowledge of this fact we owe the feeling of quietude arising from an assurance of a correct mode of construction, in seeing one of these two cases; such quiet would scarcely be felt by one of the uninitiated, since the associations of ideas here considered would then be wanting to them. An arch of low rise can support a proportionally light load alone, but on the contrary a pointed arch can support a heavy one; therefore on an association of ideas is based the visible need for a flat arch to appear lightly loaded, and a pointed one heavily loaded at the centre, i.e., a large mass should be placed at its apex. Where attention is not paid to these considerations, unpleasing effects will be produced.

The same is generally true of the forms of section of arches, that was stated in relation to side arches; it only remains to be added, that the profile of the archivolt (Fig. 257) may change its character:- 1, according to the depth of the arch; 2, according to its projection from the face of the wall; 3, according to the desired inclination of the splay for admitting light, and which is tangent to the extreme projections of the profile.

3. Arched bridges.

We here apply this term in a general way to combinations of arches and piers in bridge design, whether gate bridges or openings in a wall permitting a road to pass through under a masonry bridge, bridges of masonry or girder bridges with curved girders of wood or iron.

Gateways include gateway bridges and will be considered in connection with openings in walls. Most that we have said of piers in connection with bridge construction is also true of arched bridges, so far as these are structures with girders.

As for arched bridges of stone, they require the imposts to be made strongly prominent by a horizontal incision and a clear treatment of the abutment.

In many cases the impost of the arch will at the same time be the coping of the pier, or if the pier be lacking and coincides with the substructure or base, the covering block itself forms the impost; in other cases the arch springs directly from

the foundation of the bridge, so that an impost cornice becomes unnecessary. For known reasons of stability the lower part of the arch should be built with horizontal courses to about half the rise of a semicircular arch, rather more for a semi-elliptical arch, and about one third for a pointed arch, i.e., a wall mass gradually widening upward is formed by corbelling out the separate courses of stone, and the arch presses against this as an abutment. This abutment mass should differ from the arch itself in material and structure in many cases, and it may be made especially prominent in others (Fig. 258). At the same time the principle of economy, which plays such an important part in engineering, will generally require that to characterize the abutment it must be dressed smooth, if the arch is built of rock faced ashlar, or that it be marked by enclosing members, coats of arms, emblems and other decorative expedients if the arches are dressed smooth on ornamental city bridges. The segmental arch always requires a skewback normal to its curve, and has a bad effect if it abuts directly against the cap of a support (Fig. 259); if the arch is not bordered by moulded members it does not appear more ugly, than if these borders are composed of horizontal headers or abut against each other, unless the intersection is especially supported by a corbel. The first radial joint of the segmental arch separating it from the skewback, which is wrought from a single block or from horizontal courses, may be marked by a boldly profiled inserted slab, the skewback itself may be formed as a corbel in small bridges (Fig. 260).

If the separate bridge arches spring from skewbacks quite far apart, or the piers are of unequal width, a small arch may be inserted between the ends of the main arches to save material; this especially occurs in the bridge Quattro Capi at Rome, whose middle pier is built on a small island in the Tiber; the end piers may also be broken by gateways in many cases, or outlet openings may be left above the abutments to remove the water from the bridge way.

In the different possible arrangements many motives capable of execution are given, which admit of the most varied structural or picturesque designs in connection with offsets of piers, projecting caps, stairways, towers or bridge chapels, custom

houses, portals and similar accessories. The angle corbellings, pendentive vaults, corbellings, buttresses, monuments and groups of figures, in brief whatever aids in the enrichment of bridge construction is entirely permissible.

If girders of wood or iron having the forms of arches are combined with masonry piers, these should have proper abutments for the girders, and these should generally be skewbacks, coinciding with the radius of the arch at the joint.

γ. Covered bridges and those built upon.

If the bridge way is covered by a roof, the structural ideas result from the arrangement of the supports, which bear it, and from the arrangement of the bridge piers on which it rests; not to load the bridge too heavily, the construction of the roof should be as light as possible, and the spans between the supports as great as possible; these rules vanish at the piers themselves, when a grouped arrangement of columns is desired.

From this ground idea results the arrangement of closed pavilions, towers and portals on the end and intermediate piers of the bridge, and of open halls over the bridge way; but such arrangements are carried out in the most varied ways in the few existing examples.

5. Buttresses and Flying Buttresses.

Buttresses are either added thicknesses given to walls to prevent their yielding, or to resist the thrust of vaults; their nature is identical in both cases, since a wall can only yield sidewise in consequence of a force acting in that direction, either at a right or some other angle with the wall; it is immaterial whether this force is caused by a vault or not.

The buttress (Fig. 261) must always be arranged in the same direction as the force, whether this be perpendicular or oblique to the wall; if two or more forces act on the wall, as many buttresses must be arranged, one opposed to each force, or since the forces may be combined in a single resultant of determinate magnitude and direction, a single force may oppose its direction, with a force having the magnitude of the resultant. The force acting against a wall may be distributed over its entire surface, as in case of pressure of earth, or it may act at one or more points, in the first case it would tend to slide the entire wall sidewise; in the second it tends to overthrow

the wall or cause it to bulge.

If two or more forces act against a wall, the construction of a buttress simply consists in connecting the points of application of the forces by a rigid body, they applying to this body a force having the same line of action and magnitude as the resultant of the forces, which it holds in equilibrium.

The force F (Fig. 2-2) sufficient to move the wall sidewise is proportional to the weight P of the wall, i.e., to the pressure it exerts on its foundation and to the coefficient of friction f of the materials of the wall and foundation on each other; thus $F = P \times f$; $P = \frac{F}{f}$; $f = \frac{F}{P}$, the area and form of the bearing surface not being considered. The more firm, solid and heavy is the masonry, the less is sliding of the wall to be feared.

As for the overthrow of the wall by the force k sufficient to do this, which is proportional to the weight acting at the centre of gravity of the wall, to the distance x of the horizontal projection of the centre of gravity from the point of rotation C , and inversely proportional to the perpendicular a let fall from the point C on the line of action of the force k ; or expressed in a formula, $k = \frac{P \times x}{a}$, since from the equation of the lever, $a = g \times x$.

The formulas also shows that when the force is given, which tends to overthrow the wall, that will be more stable, the greater its weight, its thickness, and the lower the point of application of the force, or the steeper the line of action of the force, and k becomes entirely undetrimental when $C \times x$ is a maximum, or the weight or thickness of the wall = infinity, or the point of application coincides with the point of rotation.

Evidently the weight P and distance a being constant, x may be increased to have the centre of gravity fall as near its inner side as possible; this occurs if its height be increased and if it is battering externally. For example, if a wall with thickness b and height $3b$ is built in three thicknesses, the proportions of the dimensions of the first being $b : b$, of the second $2b : \frac{b}{4}$, and of the third $4b : \frac{b}{2}$, its weight and volume would be unchanged, but $= 1\frac{1}{2}b$ in the first case, in the last $= 21\frac{1}{32} = 2\frac{1}{3}b$ in round numbers. Thus the wall becomes more stable by externally having a batter or having offsets, according

to a fixed law. When $x = b$ it reaches its maximum; but this would occur when the wall is corbelled out so much on the inside, that its mass is bisected by the vertical axis A.

A buttress is nothing more than a wall mass, safe against being overthrown by its conditions of stability; its effectiveness thus increases with: 1, its projection at its base; 2, its load, i.e., with the use of heavy building stone and its increase in height; 3, by corbelling it out on the inside. The point of application and line of action of the force k are almost always given; if the buttress is arranged to resist the thrust of a vault, the point of application of the force k is found at the intersection of the tangent to the central line of pressure with a vertical through the centre of gravity (Fig. 266); the tangent K is itself the line of pressure at this point. The weight C of the wall and the buttress combines with the thrust at the point of application, forming a resultant, which must lie entirely within the buttress.

Thus the problem is as follows, if the stability of the buttress and wall is to be increased with economy of material; 1, the point of application of the force must be kept low; 2, the line of action of the force must be steeply inclined; 3, the projection of the base of the buttress is to be kept small.

The first requirement will be satisfied by making the springing point of the vault as low as possible, the second corresponds to giving the abutment as great weight as possible and to corbelling the construction out toward the interior, so as to incline the axis of the masonry inward, that is drawn through its centre of gravity; the third condition corresponds to the projection of a part of the buttress on the interior, to a reduction of its mass, when permitted by the course of the line of pressure (Fig. 267). Hence openings are admissible at the base of the buttress as well as above a line of pressure. It follows from what has been said, that the buttress should have a projection greater than its breadth, since its stability increases more with an increased projection, a heavier load and by corbelling out inside, than by an increased breadth.

According to all this, the esthetic ground ideas relating to the formation of the buttress are as follows; the buttress requires a considerable projection at its base; as a wall pilaster,

which is to be regarded as an addition at right angles to the wall for strengthening it, the thickness of the buttress must at least equal that of the wall, or it will appear too weak. Openings for doorways are admissible in its lower portion, the base of the building must be broken around it. The offsets in breadth or thickness should be covered by simple inclined planes, larger or smaller in accordance with the arrangement of the whole, and which may be covered shed or gable inclined roof stones to shed the rain water (Fig. 267). If this inclined surface be of considerable extent, it may properly terminate in a gutter with a lower opening for discharge of the water, the last affording opportunity for decorative ornament. In case of strongly projecting buttresses, not only a string course at the lower ends of the windows, but also a gallery, will be desirable sometimes, and this forms a passage around the building that requires openings through the buttresses, or to be broken around them (Fig. 268).

The separate offsets of the buttress may be treated as free ending masses, and may receive light decorative ornaments. The leading ideas relative to the top of the buttress are as follows:- It is either terminated beneath the main cornice in an inclined plane or a free ending piece of ornamental work; or it is connected with the main cornice, of which the whole or merely its upper or lower members may be broken around the buttress (Fig. 269); or lastly it interrupts the main cornice, which dies against either side of the buttress (Fig. 269); in the last case it may be terminated by heavy masses to which the two ground ideas are applicable. This load either consists of a figure decoration, or the pinnacle takes the form of a stone pier diminishing in pyramidal form, or that of a stone pier similarly diminished; the motive of groups of figures is preferably that of the Renaissance, and that of a pyramidal mass of stone belongs to the Gothic; in place of the latter obelisks and employed in the late Renaissance after the precedent of the tomb in Albano.

The most effective means of loading the upper end of the buttress always consists in corbelling out the main cornice above arches, which throw on the buttress the entire weight of the mass between two buttresses (Fig. 270); a still heavier loading is attained by means of a kind of attic story erected above

the main cornice and constructed of simple arches spanning the space between two buttresses (Fig. 271). The arches could be utilized as openings for admitting light to the attic of the building, being at the same time windows in a small corridor or in small chambers in the roof. The Gothic style indeed introduced the so-called gable dormers for this purpose to load the buttress in accordance with a similar principle.

If the buttresses are arranged inside a building, it may well happen that they need to appear externally, only as low buttresses of moderate projection (Fig. 272); these may terminate at top in any suitable manner without the necessity of vertically dividing the upper wall of a building in several stories; in other cases they may perhaps require a very wide projection, according to the arrangement of the vault, so that by vaulting over the spaces between buttresses may be formed external galleries over deep recesses, or above a row of internal chapels. (Fig. 273).

As the breadth of the buttress is diminished by offsets, there may be offsets in the thickness also, but which can only be small on account of the small thickness of the buttress; (Fig. 274); it is otherwise if perhaps bridge piers have buttress-like offsets, when the breadth of the pier is considerable, on angle buttresses of towers that are always developed on a broader base, or on additions for strengthening the angles of the bases of monuments, fountains, etc.

Groups of buttresses are always required at the angles of vaulted rooms and buildings, especially on towers, and they are sometimes employed in connection with stairway towers. The usual modes of arrangement are the following (Fig. 276); the buttress is set back from the angle at a, directly at the angle at b, or diagonally at c; the corresponding arrangements of a stairway tower would be as a', b' and c', this tower being one of the most appropriate expedients for strengthening the angle, at the same time playing an important part as a servants' stairway in many cases. The group of buttresses may combine in a mass at their base, separating above this (Fig. 277); by the use of diagonal members may be obtained peculiar arrangements of piers, as in the treatment of buttresses in Gothic style, memorial columns and similar forms of piers.

Buttresses are in nowise a monopoly of the Gothic style, so as to be suited to that alone, or that they must always be treated with Gothic forms; then are a general result of vaulted construction, and in case of a problem similar to those solved in the middle ages, we cannot dispense with this expedient of the buttress. But if we desire to give to it a Renaissance form, thus entirely neglecting the existence of the Gothic style, we should return to the forms devised by the middle ages up to a certain degree; the generally valid part of mediaeval architecture is this, that it created forms which cannot be replaced by better ones. To exclude those forms on principle, would be to advance backward. Conversely we must never feel constrained to retain the detail forms of Gothic employed in its buttresses and flying buttresses, because it knew not how to use others. On principle we should avoid the use of buttresses as merely decorative parts, as likewise occurred in the Gothic style nothing is to be resisted, but certainly must not fall into the opposite error of the Renaissance, of greatly enlarging the volutes of modillions intended for a small scale, and of employing them as purposeless forms for buttresses, in the sense of being general form symbols for the indication of a horizontal thrust.

Flying buttresses are counter arches, which do not transmit the thrust of vaults to the mass of a buttress by a heavy and inflexible buttress pier, but by an arch, which itself exercises a thrust. Flying buttresses become necessary in all basilican designs of several aisles, they may also be used when the buttresses are entirely omitted, but fixed points exist, for example rocks, massive walls, etc., to which the thrust of a vault may be transmitted. Finally they lose their function as arches exerting thrusts if free standing piers or the angle masses of towers, are connected with the principal mass of a building by oblique struts or by horizontal bridges supported by them.

The following modes of arrangement are possible;-

a, three or four aisled basilican buildings.

1, merely a single buttress is required; 2, two separate buttresses are necessary (Fig. 278). 3, to increase the resistance are necessary two flying buttresses, connected together; (Fig. 279).

4, for the same reasons but one flying buttress is required, though this must be very heavily loaded.

b, five or six aisled basilican buildings.

1, the pairs of side aisles are of different heights. Two flying buttresses are then arranged above each side aisle, as on the cathedral at Beauvais (Fig. 280), or a single flying buttress spans the outer aisle, while a second larger one is thrown over both side aisles to the centre aisle, as on the cathedral of Notre Dame at Paris (Fig. 281). m, the side aisles are of equal height, when the inner aisle requires two, and the outer aisle a single flying buttress (Fig. 282).

The buttress mass against which the flying buttress abut must satisfy the requirements stated at the beginning of this Chapter, but it is particularly necessary to locate its centre of gravity nearest its inner side by corbelling inward the masses.

The flying buttresses are themselves to be regarded as arches, and are to be correspondingly treated, they will be more stable if in the form of half a pointed arch, than that of a quadrant; further in case of very high centre aisles like those of the larger Gothic cathedrals, they not only resist the thrust of the vaults, but also hinder the vibrations of the centre aisle caused by violent storms. In such mighty structures it may happen that the total mass of the buttresses and the flying buttresses presents so large a surface to the action of the wind, that they require to be connected by transverse arches. Should such a case actually occur, the building would be concealed by a formal structure of buttresses and arches.

If the wall mass of the buttress is to be decorated, one must distinguish between those points that may be made lighter by openings without injury to their structural meaning, and those points which may be merely decorated by niches containing figures, canopies, inlaid panels, etc. To utilize the upper edges of the flying buttress as channels for rain water, which was done in the Gothic period, will seldom be repeated, being not a very practical procedure.

It is self evident that a buttress can fulfil its purpose of strengthening the wall only when the masonry is well bonded together; hence a buttress could scarcely be constructed of boulders or Cyclopean masonry. A good bond can only be obtained

with rubble of quarried stone, ashlar masonry or brickwork; the bonding of ashlar masonry would be strongest if blocks cut with reentrant angles were used (Fig. 283 a). If a wall is about 3 ft. thick with ashlar about 2 ft. long and 1 ft. wide, a buttress projecting 3 ft. and having an equal width would be well bonded as shown in Fig. 283 b. If the buttresses are built of brick masonry all offsets diminishing upward must diminish by courses.

D. OPENINGS IN WALLS.

Openings in walls are; I, openings in masonry; II, openings in walls of wood or iron. Their purpose is either the admission of light when they are windows, or to permit passage when they are doors and gateways. To the latter may be added the portals of tunnels, gateway bridges, openings for passage of water, etc. The leading idea in the formation of openings in walls results from the construction of the wall, a part of which is removed by the opening, so that the bonding is interrupted in one place, the adjustment of the interruption of the bond depends first on the clear width of the opening. The formation of the opening is further arranged in accordance with the thickness of the wall, and with the quantity of light to be admitted to the room, or in case of doors to the desired ease of passage.

The formation of openings in walls further depends on the means of closing them, and finally on the two points mentioned in Tectonics, the self limitation of the material next an opening in the form of raised members and borders, as taking the form of a withdrawal of the material from the opening and laying bare its interior.

I. Openings in masonry walls.

We shall now examine first a few problems, such as commonly occur in case of openings in walls, before considering the details of doors and windows.

a. General.

1. Spans of openings in walls and their bond.

The simplest mode of covering narrow openings in walls of masonry will be by a single lintel; this may be cut in various ways (Fig. 284); but it would thereby be weakened, and a fracture at its middle is to be feared. The fracture of a simple

lintel will less easily occur when wrought from a very hard material, or if made deeper at its centre (Figs. 284, 285; a stone hollowed out on the underside will not be as easily broken if it is formed like a keystone (Fig. 285), or if a joint be made at that point where it threatens to break. Whether hollowed or not, a stone may be protected from fracture by its load being supported otherwise, most simply by two blocks (Fig. 285). This may be most perfectly done by three voussoirs (Fig. 286) which act as an arch. The same end may be attained in many cases by allowing a keystone to extend through two courses (Fig. 286). Further, three voussoirs may be so jointed that their lower surfaces form a plane. These and other modes of covering narrow openings are especially used for cellar windows, the arched form of the covering stones may in most cases be chosen at pleasure, and it permits the most diverse forms (Fig. 287), since it is scarcely necessary to consider merely the decorative side of the arrangement.

As for what concerns the bond of these simpler constructions of openings in walls, the following motives would result from the previously treated ground laws relating to bonds, it being assumed that the construction of the covering and jambs is to be in cut stone.

1. In masonry of boulders and rubble, the stones may have irregular and inclined joints, since these kinds of masonry are better adapted to random joints than to vertical ones.

2. In polygonal and Cyclopean masonry, one must seek to obtain a suitable lintel with a horizontal underside, or to arrange three stones with radial joints (Fig. 289); further, to arrange the stones of the jambs to form regular jambs, whether vertical in rectangular, or inclined in trapezoidal openings.

An interesting example of a small window with a bond suited to Cyclopean masonry is here given from the eastern choir of the cathedral of Treves (Fig. 290), belonging to the end of the 12th century.

3. In irregular masonry mostly composed of blocks with reentrant angles, an example of which was given in Fig. 7 and found in Greece, the most varied modes of spanning the openings became possible, the joints and possible projecting bosses giving rise to peculiar forms. Such arrangements are entirely pleasing

and proper for the fortress character of many buildings, if not affected as in the windows of the new palace in Baden-Baden. (Fig. 291).

4. In mixed masonry partly built of quarried stone and partly of bricks or stones from river beds in herringbonebond, as a rule the openings should be covered by lintels, against which the bond dies; or by arches against whose top the bond stops as it may chance. Beautiful examples of such mixed masonry of the Roman period and of the middle ages are shown in the illustrations from the imperial palace in Treves and from a buttress of the Nicolai church in Bautzen (Figs. 292, 293, 294). In the first example the masonry below the springing consists of alternations of three courses of bricks with three of quarried rubble; the bricks of the arches are not trapezoidal but are merely thin bricks, and the stones are regularly dressed but not as ashlar. The bricks are $13 \frac{3}{8}$ ins. long, $1 \frac{9}{16}$ ins. thick, and the beds and joints have the same thickness as the bricks. The largest tile in the arch measures $21 \frac{5}{8}$ ins. square by $2 \frac{3}{4}$ ins. thick. The dressed stones are $5 \frac{1}{2}$ ins. thick and $7 \frac{1}{8}$ to $8 \frac{11}{16}$ ins. broad. In the last case (Fig. 294), larger blocks of granite alternate as voussoirs with smaller fragments of granite, and the masonry consists of entirely irregular granite rubble, the angles being strengthened by larger regularly dressed blocks of granite.

Copus reticulatum is seldom employed otherwise than in combination with regular arches of bricks or stone, against which abuts as may chance.

5. In peculiar kinds of ashlar masonry like that previously described, from a church in Naples and the fortress in Florence, simple narrow openings were formed, covered by a single voussoir.

6. We have already considered generally openings in ashlar masonry for small spans, as in cellar windows and openings of all kinds for admission of light. In case of wider openings, there is to be especially examined their covering by arches, (segmental, elliptical, semicircular and pointed), as well as the jointing of these arches in connection with the bond of the masonry.

To not weaken the crown of the arch, the extrados is either drawn parallel to the intrados, or the voussoirs are arranged

in accordance with the coursed bond, that the keystone may have the required height. If the arch consists of only 3, 5 or 7 stones, it will not be very difficult to bond them with the ashlar masonry, since the arch will scarcely affect more than four courses in height. for practical reasons the divisions of the arch must be so chosen as to be suited to the natural height of the courses of stone, being at most $15 \frac{3}{4}$ to $23 \frac{5}{8}$ ins. thick; for reasons of stability it is preferable to compose the arch of as many voussoirs as possible. Therefore it would be well to base the division of the arch on the least thickness of layer of the stone, since the voussoir must be wider at the extrados than on the intrados, and to divide the intrados in as many stones as the space permits, since for reasons of stability it is best to lessen the span of the arch by corbelling at the abutment, and this division may vary within tolerably distant limits.

The division of the arch into voussoirs and of the wall in courses will collide, if either division be not dependent on the other. In regard to the division of courses and voussoirs, the following cases are possible.

a, the courses are of equal height; b, heights of courses are alternately equal; c, the courses have unequal heights; d, voussoirs are of equal width; e, widths of voussoirs are alternately equal; f, their widths are unequal.

Since the construction depends entirely on the form and span of the arch over the opening, each separate case will lead to a special mode of division; it is sufficient to remember here, that strongly loaded segmental arches should have their depths increased toward the abutments (Fig. 295 a); arches with high rise, toward their crowns (Fig. 295 b); at the same time when the widths of voussoirs are unequal, they should be wider toward the crown than the abutments.

The jointing of arches of wide span or the covering of narrow openings is always to be arranged according to the heights of the courses of the material when the wall is of brick; if the arch itself is of brick it should always be constructed of voussoirs or bricks of tapered form, or the bricks may be rectangular and the mortar joints be wedge shaped. But in all cases it will be best to make the extrados of a brick arch parallel to the intrados, for it is always preferable in brick construction

to employ a normal form of brick throughout; wedge-shaped mortar joints are preferable to tapered bricks, and to dress off the outer ends of the bricks to unite well with the wall bond would not only be formal but useless.

If it is desired to make a brick arch not concentric but with a stepped extrados as in ashlar masonry (Fig. 296), this can be done in two ways, either by horizontal and vertical or horizontal and radial limiting joints, but this arrangement would possess no considerable structural value, particularly in the second case, since the bricks would have to be cut and rubbed to taper shapes, but would be justified in many cases for decorative reasons; further one would scarcely increase the depth of a pointed brick toward its crown, or of a segmental brick arch toward its ends (Fig. 297 a) for small spans, since cutting the bricks would make the strength of the arch doubtful, and to offset the bricks would make the arch appear ugly. To construct the arch of several concentric rings is structurally purposeless, since only a strengthened arch with radial joints extending through its entire depth would not only appear but would really act as such. Roman arches composed of several rows of bricks owe their strength only to the excellent mortar and not to their construction.

8. The arch may be decorated first by the alternation of the materials employed as in brick masonry, voussoirs may be inserted between the bricks of the arch. A second motive for decorating the arch consists in accenting its principal points, such as the crown, springing points, and the joints of rupture (Fig. 297 b); the brick construction of the Dutch Renaissance is characterized in this way, where keystones, imposts and stones at joints of rupture, were placed in arches of the most different kinds, while the remainder of the arch was entirely of brick.

Not only the Dutch but also the Italian Renaissance sought to relieve arched construction by accenting the springing points, points of rupture and crowns, especially in the doorways of the simpler houses and also in simple plastered ceilings, whose plainness required the invention of original motives. A few examples of such motives for doors of houses from Como, Bergamo, Bellagio and Brescia, might find place here (Figs. 298, 299, 300); the latter is more characteristic than beautiful or worthy of imitation; all the joints of the splayed soffit and jambs

radiate from a single point at the height of the human eye. But with the exception of those marked f, these joints are not real but sham ones. The idea of this sham architecture cannot be regarded otherwise than objectionable.

An esthetic motive suitable for ordinary plastered masonry consists in covering the real arch over door or window openings by a slab of stone placed before it, which may have a moulded edge or be decorated by foliage, the key stone and imposts, as well as those at the rupture joints may each be treated in its own way.

The impost is always accented and its treatment may follow the most diverse modes; foliage, heads, shields of arms, etc., are suitable for its character. The keystone being the most important point of an arched construction requires a special accent, in many cases it also serves the most diverse purposes, and may therefore sometimes be formed as a corbel to support a projecting cornice, sometimes be intended to support a bust, shield of arms or one bearing the number of the building. The noblest decoration of a keystone will always be a human head; symbolic emblems, heads of animals, etc., may be substituted for a head, according to the purpose and importance of the building.

2. Thickness of wall and light and spacial character of doors and windows.

Openings in external walls in most cases are intended for admission of light to a room, or to give access to men or animals. Even embrasures, whose direct purpose is to permit the passage of a projectile, are always to be regarded as openings for light, since they must be so arranged for the object to be seen at which the projectile is aimed. In arranging plans of openings in walls, the leading idea for windows is admission of light; for doors to facilitate access; hence the opening should be widened either outside or inside; an external widening is necessary or suitable for doors used by large numbers of persons, and for windows not to be looked through outward, as in case of high church windows; an internal widening is desirable for many doors, when a room is to be quickly emptied of people, as for theatre and church doors; also for windows intended for looking through, like those of dwellings and many public buildings.

Another reason for deciding whether an opening in a wall shall be enlarged outside or inside is the mode in which the doors or sashes are to open; if these are not folding the opening must often be splayed inside so that the door or sash does not project beyond the jamb (Fig. 301); if folding, the splayed jamb may be narrower and the opening may be splayed outside. If the door or sash is required to entirely fit into the jamb, pilasters projecting inside will sometimes be needed (Fig. 302), whose projection from the inner surface of the wall may be considerable, if the wall is not sufficiently thick to receive the entire door or sash, that it may not project inside.

Conversely in case of doors, the doorway may project from the outside of the wall, both to facilitate passage and to afford a projecting shelter, thus making the opening in the wall deeper than could be obtained with the thickness of the wall alone. This arrangement may be necessary for entrances of churches, palaces, city halls and similar buildings for public assemblies.

3. Means of closing doors and windows.

For all openings in walls intended to be temporarily open or closed, this requirement will aid in determining their arrangement in plan. Rectangular doors and windows are always preferable for rooms of dwellings on account of admission of light, the joinery, ease of opening and closing, and for placing curtains before the opening, that is usually spanned by a segmental or round arch. In public buildings, which require larger doors and windows on account of the depth of rooms to be lighted and the greater number of persons, the doors and windows need to be round headed, or the windows may be divided by mullions if quite wide; windows seldom opened by special mechanism for ventilation like those of churches and buildings for ordinary purposes of all kinds, depend less on the form of spanning the opening. It is generally unnecessary and bad to make the doors pointed at top (Fig. 304), even in case the form of arch prevailing in the building is pointed; this is one of the most common faults of architects ignorant of the spirit of Gothic, believing it necessary to make the doors pointed because of the windows.

The Gothic style indeed made doors pointed but seldom, the relieving arch was usually pointed, but the door terminated

by a straight lintel or this is cut segmental; but if the door is made pointed (Fig. 304) the internal opening must commonly have a segmental arch, since the door could not be opened if a pointed arch were used with a pointed tunnel vault above.

4. Limiting forms of the material towards openings as projections, borders and splays, its interior exposed.

We have already pursued the thought in various places, that ideas associated with convex and concave forms give the leading points for a multitude of aesthetic forms. They play a chief part in the architraves of openings in walls. Therefore the construction of these openings determine the choice of the sections of their architraves.

Let a b (Fig. 305) be the direction of a ray of light passing through an opening enlarged outside, and let c be a parallel ashlar of the wall; it is evident that the entire enlargement of the opening may be so moulded, that the splay a b forms the limit within which lies the moulding. Further, the entire space from c to d (Fig. 305 b) may be replaced by a border profile to make the architrave still wider; finally the parallel ashlar and their margins may be moved forward to the point e (Fig. 305 c), leaving the splay c d as in the first case, or this may be replaced by a moulding; in the two first cases the total width c d of the profile is greater than in the third case, but the enlargement of the opening is equal in the first and last cases, but the widths of the profiles are different. According to this principle of forming the openings, the free choice is open to us, of how wide to make the architrave, and how much to splay the opening. The principle of this kind of architrave is based on the assumption that the opening in the wall is formed by omission, when the same bond is employed for the entire wall, whether of stone or brick; or in other kinds of masonry the opening is enclosed by a layer of ashlar or bricks (Fig. 306). The second structural principle determines the choice of moulding for an opening consists in enclosing the opening by a special architrave, against which dies the masonry (Fig. 307). The masonry may be ashlar, Cyclopean, rubble, brick or any other kind, while the architrave is of stone or brick.

If we recall that by wall face we always understand the real or ideal vertical plane from which project the paneled ashlar,

and which coincides with the faces of those having triangular joints, in accordance with the first principle of the construction of openings in walls, the profile of the architrave is always behind the wall face, but it may project in front of that in accordance with the second principle; but principles must always be separated and never combined, so as to have the architrave project from the face of the wall, unless it is structurally separate from the wall, for otherwise surplus stone must be cut from each block of the architrave.

In very thick walls, the openings have very wide jambs, which may be constructed of ashlar in two ways, either as shown in plan at a and b (Fig. 308), where the splay is produced by stones set obliquely, or according to the plan c and d (Fig. 309), where the splays are replaced by rectangular offsets: the examples b and d represent the architrave as projecting considerably from the wall face. In case d the rectangular offsets may be replaced by small columns in windows and entrances, or the angles between the offsets may be filled by small columns (Fig. 310), whose capitals support arches profiled in any manner.

b. Special on doors, windows, gateways, etc.

As already stated, openings in walls are for admission of light as windows, or are passages of all kinds, doors, gateways, portals of tunnels, gateway bridges, for water, and others such as embrasures, for ventilation, etc. Windows are formed in vertical walls, either with a vertical axis like wheel windows, in which we include all windows arranged about a centre, or are skylights in ceilings. According to their uses they principally belong to dwellings, public buildings and palaces, lastly to churches. We shall now describe openings in walls in the following order.

1, windows of dwellings; 2, those of public buildings and palaces; 3, those of churches; 4, wheel windows; 5, tracery of windows; 6, skylights. We distinguish the smaller entrances of private and public buildings as:- 7, doors; 8, larger gateways including city and fortress gates and triumphal arches; 10, portals of tunnels; 11, gateway bridges; 12, openings for discharge of water, for ventilation, embrasures, etc.

1. Windows of houses.

We first consider the windows of dwellings for the reason that the most important separate motives may be derived from

these as being normal arrangements.

Windows of very plain buildings and of those merely intended for useful purposes will assume the simpler forms, already treated in the preceding pages. In this case the problem always is to obtain the best effect with the simplest means.

α. Cellar windows.

Little in general may be said here of windows in cellars of houses, sometimes introduced in dwellings, since the proportions of their forms change in each case. On account of their small height they are made as wide as possible to admit a considerable amount of light, and are then grouped by twos, threes, etc., splayed inside and spanned by a relatively low lintel, that may be omitted when the plinth itself forms the lintel (Fig. 311). The profile of the architrave may be entirely omitted or be simply treated, shaped to admit as much light as possible, with an external rebate if wooden sash are necessary or if the windows are fixed, with an internal rebate that may be omitted, if the wooden frame fits into a rebate in the stone. (Fig. 312).

If the cellar windows only serve to light the rooms in the cellar, they are generally made subordinate, but the most varied combinations with the ashlar masonry of the substructure are possible, like those mentioned in the Chapter on the simpler methods of covering small openings in walls. Peculiar arrangements result from the combination of basement and cellar windows as will be found later.

β. Windows in basement story.

Forms of windows in basement of lower story are always adapted to their arrangement

The basement of a house for rental will contain smaller and therefore less respectable dwellings, than that of the first story, since the doorway and entrance hall occupy a part of its space, or it may be taken for a small shop.

In detached houses and villas, the basement usually contains the reception room, dining room, etc., thereby becoming the principal story, while the upper story becomes subordinate and contains the bedrooms, breakfast room, nursery, boudoir, etc.; if a second or third story is found in city houses for rental, these stories likewise contain subordinate dwellings. The character of the stories must be indicated in the architecture,

but at the same time in the higher houses the basement story forms the base of the entire building, and the upper story is its termination, and since it expresses the natural feeling, or more correctly speaking, accords with the ideas associated with Above and Below, that the upper part should be light and the lower story heavier, a change must be made in the windows of the different stories, both in dimensions and in treatment.

If in general we name the story containing the best dwelling the belle etage, which may also be the basement in villas but will always be the first story in houses for rental, the following normal proportions, common in different places and based on the local units of measure, may serve as bases, and it is to be noted in this connection, that the greater part of the architecture of Dresden houses is based on a very careful consideration of practical requirements as well as the most pleasing proportions.

For an ordinary lower class for rental at Dresden.

Basement. 1 st or belle etage story. 2 nd story. 3 rd. story.

Shops. 3.94×7.55 ft.high. 3.77×7.06 3.77×7.06

The proportions in the above stories are:-

1 : 1.917 $1 : 1.87$ $1 : 1.87$

For a better house for rental:-

3.94×7.55 4.26×8.20 3.94×7.06 3.77×6.89

These proportions in the different stories are:-

1 : 1.917 $1 : 1.923$ $1 : 1.875$ $1 : 1.826$

For a larger and better house for rental:-

3.94×7.55 4.10×8.36 4.27×7.87 3.77×6.72

These proportions are:-

1 : 1.917 $1 : 1.888$ $1 : 1.846$ $1 : 1.782$

The following apply to two story villas:-

Ground or belle etage.

First story.

4.27×8.20

3.77×7.05

4.75×8.52

3.77×6.72

4.43×8.37

Stuttgart.

Basement.

First story.

2 nd story.

3 rd story.

3.28×5.58

3.44×6.89

3.28×6.06

2.95×5.40

Vienna.

3.94×6.89

3.94×7.54

3.94×7.54

3.94×6.56

Carlsruhe.

3.44 × 6.89 3.77 × 7.38 3.61 × 6.72

Berlin (according to Schinkel).

For a house for rental:-

4.60 × 8.20 4.60 × 9.20 4.60 × 8.20

For a villa:-

4.60 × 10.18 5.10 × 10.18

A few smaller Italian Renaissance palaces are given for comparison

Florence, Palace Larderel.

4.60 × 9.50 4.60 × 9.50 4.60 × 9.50

Siena, Dwelling.

3.94 × 7.82 3.61 × 6.82 3.61 × 5.57

Rome, Palace Massimi (Peruzzi).

3.87 × 7.22 4.92 × 9.20 Mezzanine.

Rome, Palace A. Massimi.

4.40 × 8.03 4.43 × 8.75 4.00 × 6.23

Rome, Palace Firenze (Vignola).

4.04' × 8.00 5.80 × 7.85 3.64 × 6.94

While the architects of the Dresden school have pretty strictly adhered to the proportions of the windows of houses here given, the dimensions given for Stuttgart, Vienna, Carlsruhe and Berlin are merely approximate, but are not the normal dimensions employed in those cities.

γ. Architraves of windows.

Architraves, like the usual moulded portions, are wrought from the usual stair step blocks in many places, where rendered possible by a great development of the quarrying of stone as in Dresden; the rough blocks have normal dimensions of 7.48 to 7.88 ins. wide, and the profile of the architrave varies from 6.02 to 6.96 ins in width; yet the same width of architrave is retained in the different stories, but this width may be increased from the least to the greatest measure, according to the richness of the profile and of the building, also according to the fineness or plainness of its character.

Since the clear width of the windows of different stories vary according to the rules of the Dresden school, but the width of their architraves remain constant with a normal width of 6.5 ins., the proportion of this to the clear width of the window varies between 1 : 7 and 1 : 9; hence the architraves of

of the narrow windows appear broad, while those of wider ones seem narrow. The Dresden dimensions are in general to be termed small, owing to the fine grained sandstone used there; the architraves of classic and Renaissance windows are generally wider, being $1/4$ to $1/6$ the clear width of window.

We have so far considered the window and its architrave as it appears as a normal on houses having smoothly plastered or stone walls, where the architrave is not produced by splaying the angles of the opening, but by the separate lintel and jambs of the window. The projection of the jamb stones in front of the face of the wall must at least be 0.9 in. for plane and 1.38 in. for moulded jambs to make its effect satisfactory; the other practical dimensions are given in Fig. 313.

This Dresden school has fixed the following normal profiles for architraves of windows for the most varied cases occurring in practice, all having a strictly Renaissance character and being suited to the Pirna sandstone used, but which still leave the proportions of details to the esthetic sense.

1. For smaller windows (Fig. 314) of simple character, 6 ins. wide and 0.904 in. projection.

2. For smaller windows of richer character, 6 in. wide and 0.904 in. projection (Fig. 315); the sunk panels may have angles filled with rosettes, and in very rich arrangements, they may be filled by delicate ornaments.

3 to 8. For windows of average size (Fig. 316), simpler and richer, finely or more plainly profiled, 6.5 ins. wide, 1.38 ins. projection.

9 to 20. For broad windows (Fig. 317), more or less simple or rich, richly or plainly profiled, with or without sunk panels, 6.97 ins. wide, projection 1.38 to 1.97 ins. (Fig 317).

In all these profiles the ease of execution, general effect, the projections of each fillet, cove, round, reverse ogee, are considered in the most careful way. The peculiarities found in these profiles are the following.

No. 1 has least projection; nos. 2, 12, 20 have sunk panels; nos. 4, 7, 8, 13, 15, 16, 17, have flats separated by rounds; nos. 2, 19, terminate with reverse ogees; No. 5 has undercut quarter round; nos. 6, 9, 19, have reverse ogee with round; no. 9 has entire profile projecting from wall face, an except-

exceptionally permissible arrangement of heavy character. Nos. 15 and 17 with splayed bands.

In all these profiles the recalling of classic forms and the treatment of the architrave with imitated forms are suppressed as improper, and the nature of the architecture is brought into the foreground.

5. The so-called Ears.

Very ancient reminiscences of wooden construction remain to the present day in the peculiar forms of the so-called ears of the architraves of windows, if we conceive two window jambs, above which is placed a lintel connected below by a crosspiece (Fig. 318), we shall obtain the form of such an architrave in the simplest way; if we carry the moulding around the edges of the ears, the motive is enriched, and the architrave of the window is harmoniously developed. The lintel (Fig. 319), which must project at least 0.9 inch, must have a height equal to the width of the architrave; the window sill, which may also form an ear 0.9 inch high, should have about the same width, and since 1.38 inch is required for the wash, it must be 2.36 ins wider than the profile of the architrave. It is easily seen that only the outer members of the architrave mouldings can be broken around the ears, or at most only the principal band in addition to these, also that the sunk panels forming squares at the angles are unsuited for application to the ears like diamond panels, since ugly angles would be produced in the first case and ugly intersections in the last. (Fig. 320).

If it be desired to break the entire profile of the architrave around the ears, their height must be equal to twice the width of the profile (Fig. 321), but the jamb must then be about 0.9 in. thicker, since a part of the ear must be cut on it, or the lintel must be stilted about half the height of the ears. (Fig. 322. The last arrangements are awkward. It is permissible to increase the height of the ear by the width of its outer moulding, so that the joint of the lintel cuts off a portion of the ear (Fig. 323), in which case the jamb must be about 0.9 in thicker.

It is to be noted here, that a variation of the arrangement of the ears, found in stucco work as well as in mitred wooden architraves, is only proper and justifiable in stone construction.

construction, where no attention need be paid to the jointing and construction, as if the architecture were changed into sculpture, which is possible in the soft stone of Paris. In stucco or plaster work, one is entirely independent of the construction and hence may change the ears at pleasure.

To employ inclined jambs or to make their profile wider below than at top, so as to obtain space for the ears, would be archaic and scarcely justifiable in normal cases. It should also be remembered, that the height of the ears may be often determined by wall members, band-like friezes that run along the wall, or by the arrangement of mouldings having less projection than the ears (Fig. 324). The Rococo idea of placing drops under the ears to indicate that the window is in the Doric style is objectionable as being a pedantic fancy, like so many things devised by a mistaken classicism.

If a window jamb stands on a separate sill, which must naturally project from the wall sufficiently to give space for the jamb, the following cases become possible:- either the architrave moulding dies against the sill (Fig. 326), against a low plinth (Fig. 327 a) or an inclined plane (Fig. 327 b), or its foot is concealed by an ornament, or lastly the moulding is returned (Fig. 327 d) so that its external band is a plinth.

The first and second arrangements mentioned have something undeveloped and incomplete; the termination of the moulding against an inclined plane was a special favorite in the middle ages and is the simplest and yet the most primitive form, suitable for the forms of jambs produced by splaying, its importance increases in case the moulding projects so much as to require splaying to carry off water, as on entrances of large size and similar architectural motives. Returning the moulding across the foot of the jamb is to be regarded as an invention of the Renaissance, and it may be single or double, either merely arranged on the front or also on the sides (Fig. 327,d,e). The most pleasing arrangement, though requiring most work in stonecutting, is that with the foot of the jamb concealed by an ornament, a mode of treatment much in favor in the German and French Renaissance.

e. Window caps.

The most obvious expedient for enriching the appearance of a

window, at the same time protecting partly from the rain and balancing the sill, is the use of caps over the windows. A relieving arch is usually arranged above the architrave of the window, over which a cap may find room; this is then separated from the architrave by a space like a frieze (Fig. 328), if the masonry is plastered, the relieving arch is concealed by the plastering, if constructed of ordinary materials; if the arch is carefully built of stone or brick it may remain visible and project beyond the surface of the plaster or face of wall; (Fig. 328); if the projection of the architrave be 1.38 ins., that of the frieze may be half as much. If the building is constructed of ashlar masonry, the relieving arch should consist of two or three ashlars, the last being cut in voussoir shape, (Fig. 329), or it should be concealed by a slab of stone that may be enclosed by a border, be decorated by relief ornaments, or be made of a nobler material.

The frieze must always project from the wall face if it is to act as such and if it be also of plaster; but it must have only the breadth of the window when ears are present, not to encroach on them. It is only justifiable to omit this frieze when the cap and lintel of the window are wrought from a single piece, and are therefore strong enough to support the weight of the wall, or when a special relieving arch is placed above them. The cap will then rest directly on the lintel of the window, from which it should always be separated by a visible joint (Fig. 330).

The cap is a horizontal stone slab built into the wall, which in the simplest way has a sloping wash at top and a drip at bottom (Fig. 331 a). Its projection requires support by a lower moulding to make it satisfy the eye (Fig. 331 b), and a higher form of development needs a crown moulding (Fig. 331 c).

According to the projection of the cap with the same height, the vertical surface may predominate over the upper and lower members as in Fig. 331 b, c, or conversely it may be reduced to a minimum by them (Fig. 332). The entire character of the cap accommodates itself to this and will be heavy for a thick slab or light for a thin one. The appearance of caps of equal height may be modified by a steep or a more nearly horizontal wash.

The upper member (Fig. 333) fulfils the purpose of a terminating or crowning member, the lower one is a horizontal supporting one (Fig. 334); Evidently in richer arrangements these members may be decorated by leaf mouldings, pearl beads, dentils and similar ornamental elements, according to circumstances.

One may take 7.48 ins. as a measure for the height of the cap in normal cases; if it is required to be lower the wash may be more inclined.

The projection of the cap may be increased as a whole by sliding the cap and its drip out farther; this mode of increasing the projection is dangerous, as the cap appears heavy in proportion to the entire architrave of the window, though not sufficiently protecting that from rain, at the same time it may appear to project too much at the ends. Caution is therefore advisable, and a moderate projection of the cap is preferable; its projection may be made less at its ends than its front, so that its underside appears unequal in breadth (Fig. 335), the upper and lower members projecting equally all round.

It is incorrect to regard a cap as a principal cornice at a reduced scale, as usually done; in many cases the cornice and cap may serve similar purposes, but on the other hand are essentially different frequently; The projecting cornice that crowns the whole may serve as the terminal member for many objects, buildings and furniture, so that supporting or crowning, light of heavy, lower and upper members seem desirable without the need of a water spout, a leading feature of the cornice of the classic temple. By traditional custom the Greeks imitated the form of the water gutter where it could not be required, just as the mediaeval architects by force of habit also employed the so-called gargoyle when it was useless. The famous door of the Erechtheum at Athens, over which a regular cap first occurs since the older Egyptian architecture, and which by the orthodox Neohellenists is esteemed to be of unique beauty exhibits a mixture of refined sculpture and a lack of architectural thought. A cap of similar character, whose crowning member is changed into a formal water gutter; may be appropriate in certain cases if the crowning member is made a gutter of thin metal above a widely projecting geison of boards. But the imitated gutter is meaningless when a mere form and fulfils no purpose, and if the Greeks did become accustomed to regard the

cornice and water gutter as inseparable ideas, or in other words reached the false conclusion, that since a water gutter must be treated as a crowning member, conversely a crowning member must be shaped like a gutter, we need not imitate any nonsense of that kind.

In like manner the Gothic style committed the fault of using the very appropriate wash (or inclined plane surface) with its drip as a natural form of cornice, where no water was to be thrown off. The Greeks employed a geison as the principal part of the cornice, making this project as far as possible, so that the shelter from the rain might be found beneath it. The middle ages feared torrents of rain but little and desired to rid themselves of the rain as rapidly as possible; in rather a short-sighted way, without sufficiently thinking of its disposal, whether any provision should be made for this or not. The need of a principal cornice exists for a wardrobe, stove or altar, just as much as for a house or tower; still in the first three cases it will act merely as a crowning member and not to carry off water. In the same way a cap may be required in the interior of a building, for furniture, niches in walls, for altars, monuments, doors and windows, stoves, etc., to satisfy esthetic requirements without fulfilling any material purpose. There always remains an affinity between a cap and a cornice if their purposes are allied, yet they are not the same, one remaining a cornice and the other a cap.

When a cap is required to have a considerable projection, with consoles of the simplest form it is that of a slab projecting strongly forward and supported by a corbel at each end (Fig. 336); to make these appear effective, the slab should project but little beyond them as much as may be necessary, while the ends may project more; the lower members of the cap are broken around the consoles, and underside of cap may be decorated by sunk panels to not seem too heavy.

The consoles may be placed above the lintel of the window or door; only occupying the height of the frieze; they will then have the same width as the architrave over which they are placed (Fig. 356), or are placed just outside the architrave that extends between them (Fig. 338); in this case a steep form is preferable, corresponding to the slender ness of the windows

No absolutely valid rule can be given for their dimensions, but a basis is to make their breadth 3.94 to 4.34 ins. and their total height 16.95 to 20.9 ins, exclusive of the lower member of the cap. These dimensions harmonize well with those given for architraves and those of the cap.

It should also be noted here, that the lower members of the cap, which are broken around the consoles, should be wrought on the cap itself, and therefore in profiling them attention must be paid to the form of the cap and also to that of the consoles.

When consoles are employed, a decoration of the frieze above the lintel is more justifiable, because it may be treated as an ornamental panel with peculiar propriety.

A further means of enriching window architecture consists in the arrangement of a window sill on which stand the jambs, and which partly serves a decorative purpose and is partly desirable on esthetic grounds, partly resulting from material needs.

5. Window sills.

As already stated, the window sill is a kind of cornice that projects sufficiently to receive the architrave, or at least 9.08 to 13.8 ins. for fully developed architrave mouldings. This projection is so great as to require some lower members, since the sill would appear too heavy without them, and these lower members must be supports. If moulded jambs are used, the front surface of the sill would seem too heavy if left smooth; therefore it may be finished with sunk panels but must project more to afford the jambs a firm support (Fig. 339). This arrangement was already known to the classic period, examples being found on the Erechtheum at Athens and the temple of Vesta at Tivoli.

In our rainy North the sill must usually have a drip to prevent the water from running down the wall, and this end is more perfectly attained when the sill has an upper crowning member, which not only throws the water farther from the wall, than a simple slab would, but also lends the entire sill a richer and more noble appearance (Fig. 340). This upper member is generally returned at the ends of the sills; the result is that the water either runs down the wall at the angles of the sill, or special precautions must be taken to prevent this evil; a further

result therefore is that the sill is longer than the total width of the window. The simplest means of leading the water away from the wall consists in forming a small spherical wash at the angles of the sill (Fig. 341), which is scarcely visible from below. The widening of the sill resulting from the addition of an upper member makes of its upper surface a very convenient support for persons looking out of the window, for flowering plants, etc. To better satisfy similar requirements, the middle ages and Renaissance styles sometimes corbelled out sills; we shall return to this later. The following modes of arranging sills are those now most common.

1. The sill is isolated and not connected with other architectural details, to form a part of the enclosure of a window, simply projecting from the wall.

2. The sill projects from a continuous string course, either flat or along it are continued the upper, lower, or all members of the sill (Fig. 342).

3. The sill is supported by consoles.

4. The sill rests on a slight projection of wall under window.

5. The sill is formed as a low base, which may be connected with the base of the building in the basement story (Fig. 343).

- 1'. In the first case, the sill should have but moderate projection, only as much as absolutely necessary. Profiles like 1, 6, 7, 8, 9, in Fig. 343 may be suitable as applicable.

- 2'. If the continuous string course is flat and projects from the wall, the profile of the sill may spring directly from it, 1 to 9, Fig. 342, or this may project by the breadth of the lower horizontal fillet. A profile like 10 permits the sill to be made lower than the string course, while the lowest vertical fillet may coincide with the string course (Fig. 344). If the string course and sill are moulded alike, the sill either does not project and coincides with the string course; or it requires support by consoles, small pilasters or slight projection, or a projection of the wall surface in case it projects beyond the string course.

If the upper or lower members of the sill are omitted in the string course, it should have a greater projection and a more solid character than in the second case; in the first it appears as a strongly projecting cornice, in the second as a lighter band with terminal or crowning members (Fig. 345).

The projection of the sill may then be obtained in different ways, either omitting the drip of string course, or supporting the sill on consoles, pilasters or a projection of the wall.

3'. If the sill be supported by consoles, the same general rules apply to them as to consoles of caps, they should have the same breadth as the architraves, beneath which they should be accurately placed; they enclose a space between them, if as often happens then rest on a base, or are connected by a small band under their lower ends (Fig. 346), and this frieze-like interspace affords opportunity for decoration by sunk panels of all kinds. The upper members of the consoles, when these are also lower members of the sill, require consideration in regard to both points. The underside of the sill, like that of the cap, may not only be decorated by sunk panels, coffers, etc., but must be so if the sill projects considerably, to remove the heavy character from the view of the underside.

4'. It will be deemed advisable in many cases to form a projection beneath the window, which not only gives it a more slender character and is therefore necessary, if the height of the window is small in proportion to its width; but also as before seen, it is desirable for widely projecting sills, that it is not desirable or possible to support by consoles. These projections may be left smooth or be decorated by sunk panels of all kinds (Fig. 346), medallions, heads, wreaths, etc. and finally may be limited at each side by short pilasters, which enclose a sunk panel (Fig. 346, right half).

5'. The development of the sill as a low base may occur on different grounds. In cases usually found in houses it may be desirable to restrict the normal external height of the window projection to about 31.5 ins., partly being a wall, the remainder an iron lattice; this will be permissible if the windows of the best story be so arranged, that their sill forms a seat on the interior, above which is placed a balustrade of iron lattice work or a fixed window, to serve as a back, or a second window to serve as a back, or a second balustrade intended to support the arms.

This will further be the case if higher proportions are to be given to the low windows of a mezzanine or upper story; and finally if for special reasons it is desirable not to place the

string course as in normal cases, at the same height as the inner beams but higher, for example to afford a stronger construction to the windows, and their relieving arches in the lower story. As a rule, the string course is then placed at the same height as the sill, but may be lower if required, and the sill then be formed like a low base (Fig. 343). It may be advisable to mention a fourth case, making the entire height 31.5 ins. of masonry, to insert a low projection between the sill and architrave, which is returned across below this panel (Fig. 347); finally a similar arrangement may be necessary or proper, for the reason that the base of the window in the basement story may be combined with the base of the building, and perhaps form a group with the cellar window also (Figs. 343, 349, 350). The drawings of forms of windows given in Figs. 348 to 350 are due to the Dresden school.

η. Abnormal forms of windows.

After discussing the windows of house architecture in accordance with normal requirements, we have to mention a few peculiar arrangements partly corresponding to the requirements of certain stories, partly employed in exceptional cases.

The Italian high Renaissance invented a form of window in a perhaps isolated case, which harmonizes with the rude character of rustic masonry without differing from the normal form in general. Antonio Sangallo the Younger desired to build himself a house, on the rusticated basement of which his invention should be employed; it consists of a simple treatment of the narrow architrave by means of flat bands and splayed surfaces, with the necessary rebate for the window shutters. The considerable thickness of the walls of a basement story afforded wide jambs and soffits to the windows, and consequently narrow architraves and these simple and severe profiles, of which a few varieties are given in Fig. 351, that are fully justified. For the same reasons, the rusticated windows of a basement story or of the shops are treated with simple architraves, which are based on the motives of a splayed surface (Fig. 352). Since the windows of shops generally require a special arrangement for the reception of iron shutters, the width of their architraves is increased by the wooden frame, and the space between the two, to receive the shutters of sheet iron. The simplest

mode of forming the sections of rusticated windows is to omit any special architrave: the rustication then either ends in front of the jamb of the window or is returned around it, stopping against a reveal, which also determines its greatest projection (Fig. 353). A further simple form of window is a favorite in the Italian Renaissance, especially for modest buildings, or for subordinate windows. It consists in leaving the outer surface of the jamb flat, its inner edge only being bordered by a simple moulding, which may project beyond the flat surface as well as recede behind it (Fig. 354). From these two motives are developed two others and very pleasing ones by corbelling out the sill, and by carrying the flat architrave around it or not. The corbelled sill may be formed independently of the profile of the architrave (Fig. 355).

Another motive was derived from these and similar arrangements, consisting in decorating the outline forms of the outer band, especially with forms of volutes like consoles in connection with foliage and palm leaves, which were employed during the high Renaissance for the most diverse purposes and arrangements; to lend a decorative character to the smaller windows of mezzanine stories, or those intended to light the vaults of rooms, in contrast to the more severe forms of the windows of the principal stories (Figs. 356, 357). Roman buildings in particular employed this expedient.

From it was developed the inexhaustible motive of the enclosure of inserted sculptures by architraves, which were built into the walls, as if found by excavations on the site of the building, and which it was sought to harmonize with the most varied effects by combining all these decorative motives with caps, sills, consoles, and other window motives. This is not the place to go into all these details, principally borrowed from palace architecture, and reference must be made therefore to publications on Italian, French and German Renaissance, which afford a multitude of ideas, which may be used in rare cases.

Mezzanine windows usually have a greater width than height, are then sometimes divided by a central mullion, or they are square, or their height rarely exceeds their width. In exceptional cases, according to the architecture in which they are employed, they may take any suitable form other than the rect-

rectangular, be treated as wheel windows or formed in any other way (Fig. 359). The same is true of all smaller openings found in all classes of buildings.

8. Abnormal forms of caps.

Different requirements may exist, which in houses of several stories lead to dissatisfaction with simple forms of window caps and to a search for richer forms. The principal cause of this is always a desire to characterize the different stories of a building. Natural requirements and associated ideas have led to the treatment of the basement as the heavy, bold and a simple story; of the best story as the most prominent one as severe and noble, of the remaining stories as subordinate, and of the uppermost as the lightest and most graceful, requiring and capable of the most decoration, further a ground law of architectural treatment consists, as often stated, not in seeking variety and richness in change of motives alone, but in enhancement of motives. From the simple window architrave we have obtained the following series of motives.

1. Architraves without ears; 2, those with ears; 3, those with caps; 4, architraves with caps on consoles; 5, those with cap and sill; 6, architrave with cap and sill supported by corbels; 7, those with cap and a special projection of wall as a base below the window; An enhancement of the motive leads to 8, where an angular pediment cap is introduced; to 9 with circular pediment cap, these being of segmental form. The latter becomes 10 by interrupting the cap by an ornamental group. In exceptional cases, a cap receives an attic story for the reception of an inscription on tablet making 11, or 12, a purely ornamental centrepiece (Fig. 360, a, b).

Let us take as an example a four story detached house (Fig. 361), which is to have four different facades, an unbroken principal facade next the street, that next the garden with a projection and the principal entrance, and two garden facades with projections; each story contains a small flat, consisting of kitchen and its appurtenances, toilet, dining room, reception room, living room, bedroom; three windows in each facade being sufficient. The house possesses ungraceful and very slender proportions; therefore the basement should be separated from the other stories by a belt, and the upper story be treated

like a frieze, i.e., enclosed by a band, thus balancing the basement story. We now have to arrange so as to make the windows of the best story more prominent than those of any other story, so as to characterize this as being the best story. We should therefore furnish the windows of the first story with caps having consoles, connecting them by a light string course, to still more moderate the slender proportions of the house. One angle projection of the house contains the living room and is therefore subordinated; the other projection contains the dining room, and is so placed as to enlarge this and increase the varied effect of the whole. The living room is marked by a window with angular pediment. If we assume the dining room to have a balcony, the door to this balcony also serving as a window, would differ from the other windows and would therefore require its special distinction. To treat the windows of the kitchen, toilet and dining room more plainly than those remaining in the small flat will hardly be proper in an assumed case, when a pleasing appearance of the house is required on the garden side, for first the unity would suffer from too great variety, and second this inferior treatment would serve to indicate those rooms that should be ignored as much as possible.

The scale would be lowered some in the second story, the window of the living room in the projection would receive a cap without pediment, but with small consoles. The other windows of this story should have caps without consoles and should be without separate sills. Finally, the windows of the third story would merely have architraves and would produce sufficient effect by their connection with the frieze; yet the window of the living room may be distinguished by an ornamental cap. (Fig. 360). The windows of the basement will fulfil their purpose if they are of simple form, since the act in connection with the base of the house, and a more severe and simple treatment than that of the windows of the best story will be proper.

In case of a house with four facades, only two of them will be seen at the same time; hence unity and variety are to be considered in the two facades seen at the same time. The principal facade appears perfectly symmetrical in our example, since but a single kind of window is found in each story.

Together with the side facade, which has a projection for

the living room, variety of appearance is obtained by the enhancement of the motives of the windows: in the same way the side and rear facades seen together form a group of varied but united effect. There still remains the description of the treatment of the doorway. This must have a transom for lighting the hall, according to circumstances. If the windows of the stair hall are arranged in the usual manner to not be at the same height as the windows of the stories, but with reference to the landings, this arrangement not only gives rise to many peculiar combinations with the string courses, but may perhaps exert an influence on the forms of the other facades. Especially since a harmony of the facades may only be obtained, when all motives occurring on them find their fullest development and resolution, so to speak, the arrangement of the stair windows assumed in our example conflicts with those of the other facades, and requires to be softened. The stair hall windows serve purposes other than those of the living rooms, and should therefore be esthetically treated in a different way. The lowest window here serves as a transom for lighting the hall, and may receive a pediment cap, angular; or its place may be occupied by a tablet inscribed with name of the owner, date of erection, etc. The window above this has a decorated circular pediment, whose character is always less severe than that of an angular pediment cap. The uppermost window may have a purely decorative cap.

We have given a preliminary indication in this example, that may recur in inexhaustible variety, according to arrangement of plan and number of stories, according to the simpler or richer, more modest or more pretentious character, how artistic expedients should be employed in a special case. The general ground laws of contrast of effect and of internal and external truth determine our choice of the different motives of form, to start from certain normals and not to throw together motives at our fancy. The law of enhancement of motives in connection with the other ground law, that a series of similar elements require the middle and ends to be made prominent as being special points, or that their recurrence in a periodic series must be accented, requires the strongest motives to characterize the points, that are to be made most prominent, the weaker to

be subordinated, and further a strict adherence to simplifying the motive of the different stories, to a certain degree, and finally that as the painter must first have a clear idea of the distribution of the brightest lights and deepest shades over his picture, one must not in the arrangement lose sight of the highest and lowest permissible limits, within which his motives may be chosen.

Thus in case of a villa consisting merely of a basement and first story, it would be in accordance with the means at our disposal, and also with the character of the building, to select for the windows of the best story, which local circumstances place in the basement, a stronger or richer motive of form, than for the other story; a window with a cap and sill, both on consoles, would usually be sufficient for the richer designs; but the stronger motive of the angular pediment or the weaker one of a decorated cap, would be restricted to those windows of the same story, which are to be specially characterized; thus the strongest motive must not be selected for the general one, leaving no means remaining for distinguishing special cases, requiring one to descend to a lesser motive. In the same way, the forms of the other and subordinate story should be reduced a degree, so that the best story may have its due effect. If the basement be also the best story, a combination of the architecture of the windows with the base and the cellar windows in a grouped motive, or the combined effect of these elements as a whole, even if not connected, will appear to bold and so rich, that the sills do not require the additional effect of corbels.

The windows of the upper story, in which are the bedrooms, breakfast room, nursery, dressing rooms and guest rooms, while the best story contain the rooms for social purposes as well as the room of the master, the common living room, etc., should be treated in a subordinate way and be simpler, therefore lighter and less severe.

Conversely, if the best story be the upper one and the ground floor be assigned to inferior purposes, the basement must be simply and boldly treated and be heavier, while the upper story requires richer and yet strong and elegant forms.

The Italian Renaissance may be reproached with having retain-

retained the Doric, Ionic and Corinthian orders, as a fixed series of the characters of the stories, and called the circular pediment Ionic and the Angular one Corinthian, forgetting that in comparing round and angular pediments of equal height, the round pediment always possesses the character of heaviness with less strength than the angular one; thence resulted a contradiction in the architecture of many palaces and houses, if Doric columns were employed in the basement and Ionic in the first story, but with alternating circular and angular pediments, as in the Pandolfini palace, Raphael's famous building at Florence. The alternation of round and angular pediment caps in the same story has its advantages in general, if the story contains more than three windows; a certain contradiction remains even in this case, as may be seen on the facade of the Bartolini palace at Florence; the stronger motives are too much concentrated. If the caps alternated in case of four windows, as in the Pandolfini palace at Florence, and the Farnese palace at Rome, a doubly ungraceful result is produced, since the ends are different without any reason therefor, and the middle is not accented. An alternation would first become suitable in case of five windows, especially if angular pediment caps were used at middle and ends, with circular pediments over the intermediate windows. Palladio employed this expedient in his beautiful Chiericati palace at Verona with good results. In case of a longer series of windows, round and angular pediments should preferably only be employed as a means of strengthening the centre and ends. The adjoined schemes (Fig. 362) give examples of ways; in which a change of motives is admissible in different cases, without injury to the unity or variety.

e. Forms of Pediment Caps.

As for the forms of angular and circular pediment caps, their heights may be made about $1/4$ to $2/9$ of their spans. The mouldings of angular and curved pediments are similar to those of horizontal caps; the two following cases may occur; the upper or crowning member is either merely carried around the pediment cap, and critted on the horizontal return, which terminates at top merely with the member connecting the fascia and the crown moulding, or the entire moulding is carried along the horizontal cornice on which rests the moulded gable, and stops against a slightly inclined plane. In the first case, the intermediate

fillet encloses the tympanum; in the last this is done by the upper fillet b. (Fig. 363).

The upper member a, if it be fully developed in front as well as sidewise, requires to be slightly broken at the angle of the cap, which in reality is less disturbing, than if this be omitted and the profile be distorted at the angle.

The vacant space enclosed by the mouldings of a circular or angular pediment, is properly decorated by an ornament, a shield of arms, head, wreath, decorative sculptures, etc. (Fig. 364), so as not to produce the impression of emptiness and heaviness; the background of this tympanum may project beyond the face of the wall in case the pediment is supported by consoles.

The classic and the Renaissance styles gave the same profile to angular and circular pediments as to horizontal caps, on which they rest. Strictly speaking, this is unnecessary; the pediment is always something different from the horizontal cap, and in many cases, it has too heavy an effect, if both have the same profile, in the horizontal cap the geison is the principal thing, but this is of secondary importance in the pediment, and the crown mould of the curved or angular pediments will take the first place as being the crowning member of the entire window, and the geison plays a subordinate part; it will therefore not be unjustifiable to make the geison of the angular or curved pediment narrower than that of the horizontal cap, to allow the crown mould of the former to predominate, but the latter to end with merely a terminal member, and to form the supporting lower member of a pediment lighter than that of the horizontal cap (Fig. 365).

Broken circular pediments are produced by accenting the middle of the arch by a grouped ornament of any kind (foliage, suspended garlands, wreaths, shields of arms, vases, palmations, heads etc.), which are placed between the volute-like ends of the broken curve (Fig. 366). The upper fillet of the crowning member is curved around the eye, formed like a rosette, against which and the ornament die the other members. These broken circular pediment caps, which are properly nothing else than ornamental crownings above a horizontal cap, permit a free treatment, which may be varied in accordance with the special use to which they are used.

If it be justifiable to break the less severe circular pediment caps and to give them a decorative character, on the contrary the breaking of the angular pediments at the apex, a favorite idea in late Roman and late Renaissance art, so that a bust or other sculpture may project above its apex, is an objectionable expedient of a degenerate art, which passes beyond its natural limits. A given motive may not be modified or enhanced at pleasure, but only within certain limits prescribed by its purpose. Many things indeed exist, which according to general principles are more or less pleasingly formed, but the justification of their existence is not based on their pleasing appearance, but on the purpose which they may serve, as we have fully stated. This pleasing effect only takes the first place in free ornament.

x. Cap with consoles.

If the caps are supported by corbels, these flank the jambs on either side. The ears are then best omitted. The consoles project directly from the wall face or from a pilaster of equal width, which may be flat or be bordered by an architrave moulding (Fig. 367). The breadth of this pilaster will be decided by the fact that the console, to appear capable of supporting the cap, must have a greater height than breadth; the higher it is, the narrower it may be, but the lower it is, the wider it should be. The breadth of the pilaster must be determined accordingly, but in normal cases it will be narrower than the architrave of the window. If the projection be broad in case of relatively low consoles, the architrave of the window must be made proportionally narrower, as in Fig. 367, since the entire finish of the window would otherwise appear too wide in proportion to the clear width of the window.

This pilaster always requires some projection from the wall face, and paneled ashlers may not therefore abut against it, but must be separated from it by a margin. If the window has a base beneath the sill, the pilasters require separate bases.

The effect of the pilasters will vary in accordance with their sections, and according to whether they are behind the band of the architrave or in the same plane with it. If one desires to lessen the projection of the caps of the windows at each end, the consoles may be placed directly above the jambs

and the lintel of the window, so as to enclose the frieze between them (Fig. 366). They then take the same breadth as the jambs, and their projection is determined by their section.

The consoles themselves, as we have seen, are either low and broad as in Figs. 366, 367, 368 and 369, or are high and narrow, as in Figs. 364, 370 and 371. Consoles resting on a base and supporting a sill may be arranged as in Fig. 372.

In corbels under sills, a difference is to be made, whether they stand beneath the architrave (Fig. 370) or under a pilaster as in Fig. 371. a further difference consists in their being upright as in Figs. 366, 367, or suspended as in Figs. 368, 369, i.e., whether the eye about which is coiled the volute is above or below. For pediment caps, narrow and high consoles as in Fig. 364, are preferable to broad and low ones, which are more suitable for lighter caps and sills.

Balcony consoles, two examples of which have been given in Fig. 373 and 374, generally require strong projections of a bold character. It will frequently be necessary to arrange several consoles above each other like corbels, so that each supports the one next above itself. This is particularly necessary in designing bay windows, which require strong supports, not for structural but for esthetic reasons. Such corbelled arrangements may be most simply profiled by being allowed to project slightly sidewise and strongly in front (Fig. 375); decorative forms may be employed instead of mouldings.

For ordinary house construction, using cut stone, a horizontal window lintel is most suitable for practical and esthetic reasons. Even in brick construction, for which the straight arch may be used, one prefers not to employ arched windows in the construction of houses, at least not for living rooms, but for stairway halls; for practical reasons because arched windows admit less light than if rectangular and of equal height, and for esthetic reasons since it is to give the house a character differing from that of palaces and public buildings. For the same reasons, one should be satisfied in house construction with the modest artistic expedients already described, and reserve richer and bolder forms for public buildings and palaces.

2. Windows of public buildings and palaces.

For the architecture of the windows of public buildings and

palaces, the determining consideration of the first importance is that the windows are generally larger and light rooms of a greater depth, than in houses, and further that the external walls are thicker. Consequently the windows require greater width and height, their jambs are wider and their axial distances are greater. These buildings from the requirements that they fulfil are also on a larger scale, more solid and massive than are usually houses, and therefore require bolder artistic expedients than they do. The greater width of the windows is first of all, since this has a decided effect. If the windows are rectangular, careful attention must be paid to removing the load from the lintel, which must have a greater height than lintels of windows in houses, so as not to break at its middle. In simple ashlar masonry, the lintel will be a single block, to relieve it the stones lying above it must be supported by corbelling and radial jointing (Fig. 376). If jambs are used, it may happen that a frieze is formed below or above the architrave moulding as at a or b, Fig. 376. A perfectly corresponding case is that in which the lintel of the window forms a complete entablature supported by pilasters, which like itself project from the wall face. (Fig. 377). This entablature has its crowning cornice, with or without pediment; a separate architrave composed of two jambs and a lintel may enclose the opening. If the pilasters are replaced by columns, we obtain the canopy window, such a favorite in the high Renaissance, with all its consequences, the pedestal, perforated parapet, etc. But this window architecture requires either a bold recession of the stories to allow the columns and their pedestals to stand free in front of the face of the wall, or the pedestals of the columns must again be supported by columns, consoles or caryatids. Finally this window motive may be developed into complete bay windows, enriched by doubling the columns, or by the aid of pilasters, or may be changed into the frequently employed loggia motive by the introduction of arches over pilasters or columns.

The arched window is developed in the simplest way from ashlar construction. Reference is here made to the general statements concerning openings in walls made under a. The palace architecture of the Italian Renaissance developed the arched

window in the most complete manner; the arches are absolutely required by the great spans of the windows. As previously stated, its form results from the principle of construction, either a special stone architrave being formed, which projects from the wall face, and which may be crowned by an entablature and pediment or a circular cap, or the archivolt moulding is wrought on the ashlar themselves. If the window is so large that the glass requires intermediate divisions, these are provided by the use of small columns or pilasters, which limit the openings in the window, the motives of the windows of the early Florentine palaces; the small columns are covered by a horizontal lintel or spanned by arches, the tympanum over them being perforated, so that a kind of window tracery is produced, with the same meaning as that of the middle ages. If the window consists of three divisions it naturally results, in case no horizontal lintel is used, that the middle part is made as high as possible, and the spandrels are filled by circles (Fig. 378 a). In case of a horizontal lintel, a large circle in the center with a smaller one at each side is an appropriate arrangement. (Fig. 378 b).

A horizontal lintel (Fig. 378 b) does not generally look well, if the tympanum of the window is filled by circles or by other closed figures, since the tangency of a complete circle and a straight line is less good esthetically, than if it were tangent to one or more curved lines. One of the best proportions for windows of three divisions is obtained by dividing the diameter in three equal parts, describing small circles on $1/3$ the diameter next each springing, then drawing a larger circle between them and the semicircle, letting the semicircles of each division of the window be tangent to these three circles (Fig. 378 c). The springing points are thereby lowered, and the upper tracery gains in importance.

Another motive for dividing windows in two or three parts, only applicable to rectangular windows, is to place horizontal lintels above the window jacks, forming transom lights above them by means of short pilasters connected by horizontal lintels also. (Fig. 379 a). This arrangement is particularly justified when the transoms are fixed, only the lower portion of the window being opened. The central vertical mullion may then

be treated as a supporting pilaster. In windows of this kind, containing three divisions, the central transom bar may be omitted, so as to make the central window higher than the side windows. The different mullions may likewise support circles and semicircles (Fig. 370 b).

3. The Church Window.

The church window falls outside the limit of ordinary construction, both from its considerable dimensions and especially by its height, as well as by its purpose of lighting the House of God, and must avoid everything of a secular nature in its appearance; therefore all decorative expedients must be avoided, which tend to recall the construction of houses and palaces. The considerable thickness of the walls afford broad jambs, that are usually splayed with or without mouldings. If the windows are not simple openings between piers or columns supporting entablatures, but are spanned by arches, all the forms of arches permissible in secular architecture are to be excluded, with the exception of the indispensable semicircular and pointed arches, which if slightly pointed or a depressed pointed arch, is always appropriate in church architecture, if a certain effect is to be produced. For church architecture, unless the forms of classic temples are not capriciously introduced therein, will always return to the forms introduced by the middle ages, more than secular architecture, assuming that the constructive principle is to govern. On esthetic grounds, the pointed arch retains its superiority over the circular arch, if properly used. Thus in a group of three church entrances or church windows, a pointed arch between two semicircular ones gives a more varied appearance, than three semicircular arches side by side. On the other hand in using the pointed arch, we are not obliged to accept all the consequences which resulted from it in Gothic. If we do not desire to build exactly in the Gothic style, but to rationally derive the architectural forms from structural and esthetic requirements, still in many special questions of church architecture, we shall touch on the Gothic style, but must before all else avoid everything specific to that style, and which may as well or even better be replaced by other forms.

4. The Wheel Window.

We can never exclude the wheel window from church architecture. It always remains that form of window most pleasing and most suitable for certain purposes. In case the wheel window is not divided by an iron framework, on account of the glazing but by stone work, one should always recur to the motives common in the middle ages, and either arrange radial mullions around a centre, whose outer ends are connected by arches in any way, or a system of perforated slabs are arranged about a centre, in which the detail forms specially belonging to the Gothic and Romanesque styles should be very carefully avoided. Thus a circle is a general form always required in architecture, but the foils and cusps of Gothic tracery being specific, are no longer necessary in church architecture. A scroll work of plant stems may be employed as a motive for the tracery of church windows, in which the jointing may be horizontal, or be arranged in accordance with the principles of arched construction.

In this way may be invented tracery, whose form entirely corresponds to the principle of the Renaissance style, while its construction and mouldings is in accordance with the mediaeval principle.

5. Window Tracery.

Vertical divisions of windows may form a system of mullions like those of mediaeval tracery, or a system of perforated horizontal slabs of stone be placed on each other. In this case likewise, the form principle of the Renaissance admits of the most varied forms, scroll work, tapestry patterns, the use of figures, plane and ornamental decorations of all kinds. The mouldings are similar in principle to those of mediaeval styles, even permitting a freer treatment. A freer form of the patterns of window tracery is suitable for the Christian church, a more strictly geometrical one for the synagogue, without the necessity of borrowing from the Moorish style. After the classic method it is possible to divide windows by placing pilasters above each other, which support horizontal intermediate cornices and are connected by arches (Fig. 381). These cornices require a wash on top. The lower part of the church window best stands on a splay (Fig. 382), which carries off the water, and ends with a drip moulding, that keeps the water off the wall.

6. Transom Windows and Skylights.

Small windows frequently serve to light the upper galleries of halls, as well as the ceiling. If they are not windows of ordinary and normal form, they may take different forms according to what may be permitted by the external architecture, circular or oblong, with angles cut off, semicircular, etc. They always play a subordinate part and are preferably decorated in accordance with the arrangement of the facade. They are sometimes placed in the frieze under the roof cornice or its entablature.

7 and 8. Doors and Gateways.

For doors and gateways of rooms, public buildings, palaces and churches, the same is applicable, which was said under a on openings in general in walls, and a portion of that stated in regard to windows. In the simplest way, the door is merely enclosed by an architrave, either with joints and a lintel projecting from the wall face, or by mouldings which recede behind the wall face and are wrought on the ashlar. The architrave should be changed below into a kind of plinth by some means, either simply dying against it or returned around it.

The section of the architrave should have $1/7$ to $1/2$ the clear width of the width of the doorway. In the early Florentine palaces with their massive bossed ashlars, the breadth of the architrave is about half that of the door. Evidently the doorway will appear weakly or strongly protected, according to the width of the architrave, and a strong protection will appear the more desirable, the greater the opening of the doorway, and may become the principal motive of the artistic treatment of a city or fortress gate, a tunnel, or a gateway bridge.

Simple rectangular doors with horizontal lintels yield the following series of motives with the aid of the columnar order.

1. The architrave has an added frieze and cap; the progressive additions for enriching this motive are:- consoles under the cap, pilasters on which rise the consoles, a pediment, an attic story, or a transom window above a cap, additions which admit of the most manifold variations of form, according to the special circumstances.

2. The architrave of the door is flanked by pilasters of columns, which support an entablature. The pilasters or columns may be with or without pedestals, may be arranged in pairs, the

entablature may be covered by a pediment, or may form a balcony.

Doors and gateways covered by arches admit of a series of motives, from the simplest to the richest case, with enrichments by the expedients already mentioned, especially by making the springing blocks and keystones prominent. If paneled ashlars be added, as in many palaces, or three gateways are connected in a group, the richest forms are produced, like those invented by the Italian Renaissance in palaces, gates of fortifications and cities, and also those erected in our time. The last named motive of the triumphal arch may be varied in different ways, according to whether the openings are of equal widths, or the middle one is widest, or whether coupled pilasters or columns with or without pedestals are used, and from this by placing a second one over the first was derived the motive of a two-story triumphal arch employed in many Renaissance churches. The motive of the triumphal arch is likewise best suited to magnificent city gates and will so remain, since the central opening of wider span for carriages, and the narrower side openings for persons on foot, can scarcely be more properly combined in a group otherwise than in this way. By the addition of an attic, a crowning group of figures, and especially of sculptured decorations, or lastly by flanking it with two successive towers, the motive of the triumphal arch forms a decorative architectural work of the first rank, which may as well be employed as a motive for a city gate, or the portal of a bridge, as for the facade of a church.

In houses, palaces or public buildings, where the plan permits, should be arranged a small porch before the entrance doorway (Fig. 383 a, b), or a projecting porch is constructed, which supports a balcony or terrace. Both arrangements admit of the most varied forms, according to their connection with the other architecture.

Such porches are much used at the principal entrances of churches, and are often indispensable on account of protection from wind and weather. They are then placed between two towers, or form the lower story of a tower, or lastly they project from the facade. On account of the thickness of the walls, the portals of churches always have very wide jambs, which should be treated in accordance with what was said under a in general.

They should always ~~have~~ more or less nearly approximate the church portals of the Romanesque style in their external form, yet avoiding all that could recall them. This is caused by the given conditions, which lead to like results under similar circumstances.

9. Portals of Tunnels, Culverts, Gateway Bridges, Openings for Ventilation, Embrasures, etc.

All openings in walls comprised under this title and serving purely material needs usually require but a small amount of decoration, which is entirely dependent on the part played by the building or structure. In a city, tunnels, gate bridges, other bridges and fortifications, require greater expenditure for architectural purposes, than if in a wild mountain solitude; but even the least of such necessary buildings must fulfil their purpose in the most complete way, and a form must be given to them by the human intellect, beyond the requirements of absolute necessity.

Tunnels for railways, canals or other highways, will always be located where stone is to be found, suitable for structural purposes. They are openings that require to be enclosed, and since they are almost always arched, this arch will of itself form the enclosure. Rusticated ashlers, bold archivolt mouldings, a prominence of the springing and key stones of the arch, will form the most natural expedients for their decoration. Facades are sometimes built in front of tunnels, which may be crowned by a cornice with battlements or a parapet flanked by angle towers, and decorated by shields of arms and inscribed tablets. In general, all superfluous decoration is to be avoided, in case it is not in a city and is also exposed to view of persons on foot. The time for observing the architecture of a tunnel while traveling on a railway is usually so brief, the change of impressions is so rapid while in motion, that the portal of the tunnel is only momentarily seen and its form is quickly forgotten. It is somewhat different if a street extends along the railway, so that persons on foot have time and opportunity for examining the structure.

It is generally advisable in engineering works and fortifications for sake of economy, to make the most extensive use of rock faced ashlar masonry. From it such structures derive a

character of earnestness and strength. All pretty forms are entirely forbidden in this case, since they do not harmonize with the character of these usually massive structures.

Battlements are always suitable as a crowning member of walls because forming a simple and effective motive. For the projections of cornices, massive corbels, corbelling like that under a bay window and similar expedients of the mason's and stone-cutter's art are suitable. See Chapter on City Gates.

Embrasures, openings for ventilation and similar subordinate openings in walls, openings for discharge of water, etc., are best left simple and just as required by their purposes, without further development. It lies in the nature of the case, that openings in walls should be treated in accordance with their importance and location. The more subordinate their importance, the less emphasis should be laid on making their forms more elaborate, than is required by the material need, therefore avoiding all that might appear pretentious. The solidity of the masonry must be the predominating means with careful execution, which determines the appearance of the building. The Barocco period indeed went so far as to decorate the embrasures of fortifications, one of many errors that we must avoid.

E. FLOORS.

1. Stone Pavements.

Stone pavements for streets, squares and courtyards, etc. are either composed of specially prepared paving stones, or of stones from rivers, or of quarried stones. In our era stone pavements are seldom employed for which a decorative appearance is intended. When such is desired, paving blocks of two colors are used, by the aid of which simple enclosed panels may be formed; the stones must evidently all be of equal hardness. In earlier times such pavements were made of stones of different shapes, i.e., of cubes and oblong forms. Such a pavement is found on the cathedral hill in Trieste (Fig. 384) and a similar one is in Rome.

Pleasant pavements have been constructed in different places, of river stones and broken stones, which must all have approximately the same size. Generally square panels are formed with the larger stones, whose diagonals are also indicated, or oblong panels are filled by closely set paving blocks. If the river

stones are long and oval, they are usually laid in the pavement in herringbone bond. Separate figures may be composed of small stones with river or broken stones in pavements like mosaics. Fine examples of such pavements are to be found in Freiburg in Baden, in the greatest variety of patterns, very carefully constructed of river stones and with separate figures like mosaics.

2. Floors of Stone Slabs.

The simplest kind of floors of stone slabs, also employed for entire pavements of cities, is that composed of stone blocks like the ancient street pavements. In this respect the polygonal pavements of the city of Florence are imposing, with their very large and carefully set slabs and blocks of stone.

Square slabs are much used for covering the floors of churches, vestibules, corridors and passages, courtyards, etc. A favorite method is to use differently colored kinds of marble to produce patterns like mosaics. A specimen of ancient stone intersia from S. Gereon in Cologne is composed of Rhenish slate, into which are inserted figures of Ercbithal ~~tufa~~; a second one from the same place consists of slabs of white sandstone, in which are regularly inlaid figures of red and green porphyry. Intersias and mosaic floors may represent geometrical or ornamental tapestry patterns, or even figure compositions, as in many Pompeian houses and in the cathedral of Siena.

3. Floors of Bricks and Tiles.

Ordinary brick paving is always laid in regular bond, and the ornamental bonds are recommended for bricks set on edge, which produce patterns of all kinds. If it is desirable to employ colored bricks, they must not be enameled, but must be entirely self colored, so as to retain their appearance after use and to prevent slipping. It is not only permissible but even proper to make brick pavements of moulded blocks, whose forms are suited to a mosaic system. Especially those with congruent figure elements, to accent the solidity. Artificial stone may also be used instead of bricks if composed of very hard materials. These are used in the most varied geometrical patterns. Either flat pressed, raised or sunken tiles are employed for tile floors. The first may have the pattern burnt on in different colors, as on the Mettlach tiles. The patterns always form a network like tapestry, in case of either flat or

pressed tiles, whose forms depend on the stamp by which they are impressed. The same ground principles are applicable to tiles set in walls, only that glazed or vitrified tiles should be used, that are less suitable for pavements because of the danger of slipping.

4. Floors of Artificial Stone.

Concrete floors are composed of concrete, cement, or gypsum, laid on a bottom layer of bricks. A pattern may be produced by mixing different colors in the mass. A very suitable treatment is that employed in Michelangelo's Library of S. Lorenzo at Florence, where the forms of the floor are directly based on those of the ceiling.

5. Wooden Floors.

The only wooden floors here mentioned will be those of parquetry. They are either solid, i.e., composed of matched pieces of wood, or are veneered. In all cases they are wood mosaics or intarsias, which determines their form and prescribes their limitations. The mosaic system is especially suited to determine the forms of veneered floors, since the separate elements are cut from blocks, having the corresponding cross sections.

F. TREATMENT OF THE MASS OF A BUILDING.

1. Height and Character of the Stories.

The heights of the stories are determined by the heights of the rooms, and these depend on their areas. An old school rule gives us a basis, that the height of a room should equal $\frac{2}{3}$ to $\frac{3}{4}$ its width, or its length + breadth, or the half diagonal of the plan. These ratios afford starting points that may often be useful. The *Handbuche der Architekten*, II, p. 76, gives 7.4 to 9.8 ft as the least height of living rooms for human beings; the largest and finest room of a house, that is 19.7×29.5 ft., will not appear too low if its height be 14.75 ft. The proportions for houses and villas introduced by the Dresden school may be used as average proportions. The depth of the front rooms is assumed to be 19.7 to 21.3 ft., and the height of stories as measured from top to top of floor; for the basement story of a detached villa, 13.96 ft.; for its upper story 12.15 ft.; for a city house with shops in the basement story, the heights of stories from below upward are 14.8, 13.95, 13.45,

and 12.8 ft. In case the depth of the front rooms be 14.8 ft., the above mentioned book gives 10.5 to 11.45 ft. as the height of story for houses for renting. In Vienna and Berlin are to be found stories of 16 ft. and over. At least 5.9 ft. is necessary for the clear height of rooms in mezzanine stories. The principal stories of palaces and chateaus measure from 16.4 to 36.15 ft. from floor to floor.

Building.	Basement.	Main Story.
Dresden, Oppenheim Palace	16.20	16.60 ft.
Berlin, Royal Palace	20.00	21.50
Berlin, Conrad's House	15.40	17.70
Dresden, Kapher Palace	17.20	18.40
Berlin, Old Palace (Schloss)		23.00
Caserta, Royal Palace		26.25
Paris, Louvre		27.85
Florence, Strozzi Palace		30.20
Rome, Farnese Palace		29.50
Florence, Pitti Palace		36.10

This extract from Baukunde, II, p. 75, gives a series of well known palaces, the heights of whose stories may be taken as normals for public buildings also. School rooms must be at least 11.5 ft. high in the clear, or 13.1 ft. for classes of 100 pupils. The large hall or singing hall must be at least 16.4 ft. high. The preceding heights of the stories of palaces are intimately connected with their external architecture.

The external character of the stories, their purposes and their heights, are always intimately connected. The cellar story of houses or of public buildings, will always be subordinate, even if containing living rooms. Its height does not exceed that of the base of the building, and it requires a plain and massive treatment.

The basement may have a different purpose. It is occupied by shops in city houses, which require the widest show windows possible, or by modest city dwellings. It is very commonly the principal story of villas, as we have already seen, and contains the rooms for social purposes, while the upper story is occupied by bedrooms, rooms for guests, nursery, etc. In the last case, the basement is always the most richly decorated story.

The first story is generally the principal story, both in

houses for rental, as well as in palaces and public buildings, and its external appearance must therefore express this in its architecture. Consequently it will be most richly and elegantly treated, while the basement is simple and massive. If a mezzanine story is added, it must be treated with discretion, like the first story.

A second or third story always plays a subordinate part. In large houses for rental, these stories contain perhaps two or three separate flats, while the principal story contains only a single dwelling of high character. The second and third stories are accordingly to be more simply treated.

An uppermost story, that contrasts with the basement in buildings of three or more stories, should in very many cases be formed like a wide band connected with the principal cornice, and terminating the building at its top in a characteristic way. Since it usually appears too low and light in comparison with the heavy masses of the lower story, it should also be more lightly and ornamentally treated, and it may frequently be connected with dormer windows or crowning gables. To connect together the windows of the upper story, wall panels, niches with figures, arcades etc. are arranged.

An attic may be placed above the principal cornice, behind which is concealed a story in the roof, or it may be characterized by dormer windows, or a so-called mansard roof may be constructed.

In rare cases the upper story of a house containing several stories is the principal story, as in many Italian cities, where the best story is placed at the top on account of the fresh air and fine view, while the lower stories are devoted to subordinate purposes, offices or less expensive dwellings.

2. Water Tables, String Courses and Cornices.

a. Water Tables.

Most buildings are limited at bottom by a base, which forms the transition from the masonry of the foundation to that of the basement and projects in front of the wall face by about the difference in the thickness of the walls. If cellar windows are employed, they can be arranged in the base, which extends around the building like a wide band.

The base most properly begins with a broad member and is cr-

crowned by a cap, above which begins the lower part of the lower story (Fig. 385 a). The top of this cap is at the same height as the top of the beams of the internal floor. The lower member is usually separated from the die of the base by a base member (Fig. 385 b), and is inclined if necessary; the cap is also with a crowning member and a supporting lower member (Fig. 385 c); its upper surface is inclined, and its edge may also be inclined forward (Fig. 385 d). Above the wash of the cap is placed the base member proper of the wall, which may be broken around any existing projections beneath windows. These projections may be formed in different ways, as we have already seen, according as their external appearance is to be relatively high or low, and if a separate window sill is arranged, this with the base member may be changed into a second base above the cap of the base proper. In given cases many special solutions may be derived from the internal requirements, a few specimens of which are given in Figs. 343, 348 and 350, from Professor Nicolai of the Dresden school.

In palaces and public buildings, the base assumes a greater importance, and avails itself of stronger means of expression. In a few Florentine palaces, it projects considerably as a seat. The bases of churches generally require a strong projection to correspond to their considerable height.

In cities where dwellings are found in cellars, the base often has a considerable height to afford a greater height of windows. It is not possible to go into the endless number of distinct solutions of the formation of the bases of buildings, to place them under a common point of view. There sometimes exist diversities in the ground, peculiar dispositions in the plan, the connection of the base with the principal entrance, with terraces or external steps, which lead to special arrangements. Projections of the masonry, columns, pilasters, with or without pedestals, influence the form of the base, as well as rusticated masonry, which is much used for the base, further cellar and subcellar windows, etc., windows of crypts in churches, etc. The base will always be modified according to the form, arrangement and proportions of the windows of the basement story.

A considerable influence is then exercised by the fact, whe-

whether the spaces under the windows project or are recessed back of the wall face. Also by the arrangement of shops, whose large show windows render a low base desirable.

A base will be in place in the principal story in many cases. It then usually has a slight projection and consists of a plinth, and a flat or moulded and decorated band, whose height corresponds to that of the window sills.

Fluted or slightly projecting string courses with upper and lower members may appropriately be used at the height of the window sills and caps, at the eaves in rectangular, or the height of the springing of the arches over round headed windows; they subdivide the stories in smaller divisions, and may be desirable for producing an animated division of the wall.

3. String Courses.

String courses are sometimes employed for separating the stories. At least the principal story must be separated by a string course from the one next below it, or if it be itself the basement story, from the one next above. Whether all the stories should be separated by string courses or not, will be decided by the number and character of the stories as well as the length of the building. If a ruled appearance of the building is to be avoided in four or five story buildings, perhaps only the basement story with the mezzanine may be separated from the principal story by a string course, and the upper story be divided in the same way from those beneath it.

The forms of string courses should be as different as possible from those of the cornice; therefore they should have no greater projection than necessary, so as not to conceal the lower part of the next story by their projection. The larger string courses that separate the principal story from that next below, usually consist of a geison with water drip, upper and lower mouldings (Fig. 386). The string course will appear heavier or lighter according to the prominence of the geison and the forms of the members. It will be enriched and strengthened by the introduction of dentils. The string course must always have an inclined upper surface to lead off the water, with or without a cove, by which the effective height of the course may be reduced.

In richer designs, the string course may be separated from the wall by a frieze, beneath which may be a bordering member.

The string courses of the other stories must be kept less prominent and be differently profiled from the principal one, either by increasing the upper and lower members so as to diminish the height of the fascia, or by replacing it by a quarter round or cove, or lastly by forming the string course at pleasure, composing it from the proper elementary forms in a suitable way (Fig. 367). These string courses may also be combined with a frieze.

To decorate the separate parts of string courses by means of the expedients of antique architecture would not be normal in stone construction and for houses on account of the expense. It must be required, that it looks well without decorative accessories. On the contrary, this luxury may be allowed in public buildings, palaces and churches, according to circumstances and the principal stress is to be laid on the fact, that these ornaments also contribute to the effect; therefore we shall do well with plain buildings under the weak sunshine of our North, and with the darkening of stone in consequence of the abundant coal smoke, not to lose ourselves in the finesse of Grecian ornamentation, but to adhere more closely to the severe forms of Roman and Renaissance architecture as models. Since we have neither Greek proportions, strong light nor noble marble, we must make allowances for conditions entirely different.

γ. Cornices.

The main cornice has the material purpose of projecting the masonry from rain as much as possible, as well as to receive a gutter, and the ideal one of terminating and crowning the top of the building. The height of the cornice depends on the effect to be produced, its projection, or how far the material employed may freely project. The higher the cornice, the lower will the building appear in proportion, and the lower it is, higher will seem the building. The fewer the number of stories in a building, the less necessity exists for the cornice to appear high. Therefore the cornices of low buildings should be

proportionally high, and of high ones low. The following buildings of the Italian Renaissance may serve as guides. The height of the cornice without the frieze, measured from the bottom of the lowest to the top of the highest member, is as follows, compared to the total height of the building. Villa

Farnesina, $1/20$; Pandolfini palace, $1/14$; Strozzi palace, $1/16$; Condi palace, $1/18$. The entire cornice including architrave and frieze amounts to about $1/21$ of the total height in the Cancelleria at Rome, $1/16$ in the Fucellai palace, $1/8$ in Villa Farnesina and the Pandolfini palace, about $2/13$ in the library of S. Mark at Venice, and $1/9$ at Bevilacqua palace at Verona.

On modern buildings of the Dresden school, the entablature including frieze and architrave measures about $1/17$ of the total height of the building, or about $1/30$ to $1/40$ omitting the frieze and architrave. Other schools of architecture employ bolder cornices, those of the Dresden school have an elegant and refined effect, without appearing too small. Gnauch obtained good proportions in two palaces at Stuttgart in employing $1/10$ to $1/12$ for the entablature or $1/25$ to $1/27$ for the cornice alone. No fixed rule of normal proportions exists for height of cornices, but only starting points are given at most, for these proportions depend on those of the entire building, its stories and absolute height, as well as the point of view. It must be left to artistic feeling to find the correct proportions in each case. The extreme distance possible from the observer and the building is also decisive in regard to proportions and height of the cornice. Genoa is characteristic in this respect with its narrow streets and tall palaces, high string courses and cornices. The projection of the cornice is determined by its construction chiefly. If the projection and height are made equal (Fig. 388), making h = height, the area of the cross section is about $1/2 h^2$ so far as it projects beyond the wall face; this section corresponds to a rectangle of $h \times 1/2 h$. Hence the block of stone must extend at least half as far into the wall as its height, and the more the projection exceeds the height. From this are derived the following ground principles. 1, material is saved by small projection; 2, in case of greater projection the stone should be hollowed as much as possible; 3, the cost increases with increased projection and height.

If a larger entablature is composed of several blocks of stone, attention must be paid to an equilibrium of overhanging parts with those built in the wall, and it may happen that it projects that the entablature projects as far behind the wall face as in front, when all the blocks are fastened together

by clamps (Fig. 389), or at least enough so that the area of the shaded portion in Fig. 390 exceeds the other part. From the entire discussion it results that a continuation of the wall in form of an attic story is preferable, to bring the centre of gravity of the cornice as near as possible to the axis of the wall. Further that it is desirable to lighten the entablature as much as possible by the use of modillions, dentils and ornamented mouldings. But it is to be noted here, that the modillions must not be cut from the same block as the geison, but they must be in a separate one, since the geison would be too heavy and the purpose of the modillions would be lost. Thus the mutules and their drops in the Doric style are objectionable as being the contrary, and it would be better to treat the underside of the geison with sunk panels. Further the dentils by which cornices are made lighter and animated are useless if their projection is slight, and therefore are best omitted in string courses of small projection.

In its simplest form, a cornice now consists of three elements, the strongly projecting geison, the supporting lower members, and the crowning upper members (Fig. 391). The geison is hollowed on its underside to form a water drip.

If as in Greek architecture the crowning member or cyma also forms a gutter, this must be much higher than the facia and so becomes a dominating motive, and to not unnecessarily increase the weight, a steep and slightly projection is given to it (Fig. 392). But the facia predominates in most cases, and the crowning member is best wrought on the same block as the geison and not separately in case an actual gutter is used. In richer forms weaker members are inserted between the cyma and geison.

By our method of stonecutting, i.e., making all cut stones from rectangular blocks, it is absolutely necessary to retain the horizontal joint *a f* under the geison (Fig. 393). If it is desired to treat the underside of the geison with sunk panels, the drip should be short and bordered panels should be inserted between it and the supporting lower members (Fig. 394).

The readiest expedient for enriching and strengthening the cornice is the insertion of a second projection between the supporting lower members increasing them. (Fig. 394). This second projection is preferably formed by dentils (Fig. 394).

between it and the geison are placed modillions in still richer cornices, around which the upper mouldings of this course are broken. In the richest cornices a group of members is placed under this row of modillions, and even another projection with its upper and lower members.

A frieze and eventually an architrave is placed below the cornice whenever required by esthetic needs. The frieze may remain flat or may be decorated (Fig. 394 a), or it can be formed of a series of vertical modillions as in a fine example by Vignola, which permits a still greater projection of cornice.

All modern cornices are merely variations of this motive, already fixed by the classic and Renaissance styles; the question therefore is whether one will adhere more or less closely to Grecian, Roman or Renaissance architecture, whether he will adhere strictly to the columnar orders or not, or the cornice shall be ornamented and in what manner.

The architrave may be made lower in facades, since it is completely built into the wall, than when used over a colonnade or portico, which require the stones to have a certain strength.

8. Interruptions of Cornices.

A peculiar conflict arises if the centre or end portions of a facade in three divisions are made higher. If the cornice of the lower part is carried across the entire facade, a main cornice will then be used as a string course, which is unseen, or the higher portion must be made to project sufficiently, that the cornice of the lower portion may die against it (Fig. 395 a), b). It will then be best to strive to adjust this, so that a portion of the cornice of the lower part of the building may be changed to a string course for the higher portion (Fig. 395 c). Or the string course of the higher portion is broken around and unites with the cornice of the lower portion (395 d).

To let the cornice of the lower part simply abut against the projection of the higher part, as done in Greek architecture and by the advocates of that style in our era, is and remains a faulty expedient of an undeveloped art. The architecture should at least be so arranged, that at the height of the architrave of the lower portion a slightly projecting band extends around the higher part to preserve continuous lines and to properly connect the parts (Fig. 396).

If we follow the principles of Greek antiquity in such cases, we shall only too readily employ two different scales, which was usually happily avoided by the Renaissance style.

3. Stories not separated by horizontal Members.

Instead of separating the stories by string courses, it is sometimes customary to carry the masonry unbroken from the base to the cornice, dividing the wall by projecting pilasters or projections, thus forming it in vertical stripes; even columns extending from base to cornice are employed in this manner. Although a powerful effect may be produced by this means, the arrangement containing an internal contradiction. It is always most natural to allow horizontal lines to dominate, and even when vertical projections of the wall are arranged in form of pilasters, etc., no reason exists for suppressing the horizontal members, which may either stop against the vertical projections or be broken around them. Even Gothic church architecture, which made vertical lines dominant, never suppressed horizontal divisions, but on the contrary, treated them the more boldly in the places where they were justifiable.

4. Galleries, Balconies, Verandahs, Bay Windows, Corbellings, etc.

a. Galleries, balconies and verandahs.

Halls, whether intended for church or secular purposes frequently have galleries on one or more sides. When they are of small breadth, they may be formed by corbelling out beams of stone, wood or iron, which support the architrave or floor, but in order to appear strong, they require to be supported by consoles, corbels, etc. Galleries, several of which may be placed over each other, are either vaulted or not vaulted; are open to the interior of the hall and rest on arcades or colonnades. They have solid or perforated balustrades in front, and may be treated like a series of connected windows. These galleries become porticos, loggias and verandahs on the exterior of a building, porticos being understood to signify a long hall open at one side, a loggia being a living room open at least on two sides, and verandahs are similar structures of lightest construction. These rooms are intended for living in the open air, so as to enjoy the fresh air and fine views, may be arranged in houses as well as in public buildings. If covered, the

lighting of the room behind is impaired in case it is lighted by front windows. A construction as light as possible, slender supports and as many openings as convenient, are therefore desirable, and the entire character will be thus determined, which pleasantly contrasts with the more solid facade, that is broken or extended by the portico, etc.

β. Bay windows and balconies.

Bay windows and balconies are rooms outside a house constructed by corbelling out the walls, as usually defined. They may also be added to the walls of cities and fortifications, terraces of chateaus, towers, etc. They are always occupied rooms obtained by projections, are finished with balustrades and are supported by corbels, consoles, vaults, etc.

The ordinary balcony is generally a single stone slab supported by consoles or corbels, whose thickness is about the same as the depth of a string course, its edge being moulded like the latter. The thickness of this slab depends on the material, on the projection of the balcony, and on its loading by the persons who may be on it. Its underside may be decorated by sunk panels of any kind, provided that they do not materially weaken the slab. It may project considerably beyond the consoles. If all unnecessary weight of the balcony is avoided, open balustrades of wrought iron are preferable to solid ones of stone or masonry; the wrought iron rods and ornaments, as in balustrades of stairs, must be placed so near together, that a child's head cannot pass through, so not exceeding 6.7 to 7.1 ins. The height of the balustrade should be scarcely less than 3 ft. The same is true of balustrades in general. Those of balconies and of galleries are constructed also of perforated slabs of stone let into angle posts and covered by caps. These caps may have profiles like those of window sills and should be at the same height.

Balustrades of perforated stone slabs are very pleasing in construction with ornaments of wrought iron. Since the Renaissance period, balustrades composed of short supports like vases have been and will remain in use. The intervals between them may be filled by ornaments of wrought iron, which produce a very good effect.

Evidently the balustrades of bay windows of living rooms and of halls of all kinds must be solid. If it is desired to perf-

perforate them, a solid panel must be placed behind them. The bay windows have a pleasing effect in connection with the entrance door, giving rise to many peculiar arrangements. The bay angles of corner houses are places especially favorable for a angle bay windows. Hence they may differ greatly in form of plan, be oblong, square, circular, etc.

5. Stairs.

We do not have to consider the construction of stairs and their arrangement, but principally their forms. Accordingly in their arrangement, they are straight, i.e. with a straight course, and winding with a curved course. The steps may be supported by a string at one and or this may be omitted, or by small columns or piers forming a system of tracery. The balustrade and hand rail encloses the stairs on their open side; the under sides of the landings influence the effect of the design in many cases, as well as the newels against which the hand rail usually stops.

A. Stairs with and without carriages.

If the steps lie on each other so as to be supported without a carriage, the ends and undersides of the steps may be decorated by sunk panels of varied forms. If strings are used, these may be simply inclined like the rise of the steps, or they may be formed in steps on their upper edges, or lastly steps may alternate with inclined parts. (Fig. 397).

These three arrangements will be more or less suitable according to the arrangement of the balustrade. A moulded upper edge and moulded underside of the string will have a pleasing effect. The string may also be so treated as to form a series of supports like consoles (Fig. 398).

B. Stairs on vaults.

Stairs are vaulted underneath in many cases. The most different kinds of vaults may thus be used. Stairs whose steps are built into the walls at each end give rise to a very pleasing arrangement by constructing an arch under each step, so that the vault itself ascends in a stepped form. The same principle produces peculiar and pleasing forms in winding stairs, that are especially adapted to brick construction. One of the most pleasing kinds of stairs is that in which four straight flights run around a square opening; If the stairs and landings are then supported by groin vaults, these are alternately

inclined, producing very varied forms of ceilings.

One of the most beautiful motives for the treatment of stairs was a particular favorite in mediæval church architecture, and is that where the steps are supported by small columns. If these are changed into tracery, they lead to most varied forms, suitable for small stairs, especially those used in houses within the rooms themselves or in church architecture.

γ. Balustrades of Stairs.

These are of stone or of iron. If made of stone the hand rail is supported by balusters, though small columns are also favorites. Or perforated slabs are arranged, either decorated by free ornaments or formed of tracery in strictly geometrical patterns. Balustrades of wrought iron are particularly suitable, which consist of vertical decorated bars or of free scroll work. Cast iron and bronze may also be used, though cast iron will seldom be employed for balusters on account of its brittleness and bronze is so expensive, that stone or wrought iron will be preferred. Cast zinc is very suitable for the interiors of buildings but requires to be painted or gilded on account of its unpleasant color. Evidently wooden balustrades would only be used for wooden stairs and may be composed of separate pieces, or be actual wood carvings. On the other hand, wrought iron balustrades are also suitable for wooden stairs.

δ. Angle newel of Stairs.

Against these about the balustrades, the hand rails and the carriage, and they afford opportunity for the most varied treatment. Care must always be taken to have the parts just named join the newels in a natural way and properly. The newels are suited to receive a gas fixture, a vase of flowers, an ornamental figure, or one supporting a coat of arms, etc. Their forms are treated in accordance with the particular case for which they are used, with their arrangement, and with the material of which they are constructed. They always require a plinth and a cap, and in many cases a crowning ornament; the forms of the plinth and cap should harmonize with those of the carriage and hand rail, with which they may or may not be connected.

ε. Landings.

Care must always be taken to secure a pleasing treatment of the landing slab, in case the underside is not concealed by v

vaults. Shallow sunk panels are suitable to not weaken the landing slab; the maximum depth to which they may be sunk depends on the thickness and clear span of the slab, and on the particular case in which it is used. If large numbers of men use the stairs in buildings at certain hours, as in schools, theatres, concert halls, etc., it may become dangerous to weaken the slabs. Therefore one must always carefully consider in special cases, whether the panels may be deep or shallow, and this is also true of balconies.

C. Winding Stairs.

The undersides of the steps or winding stairs are either left of rectangular section, or they are dressed off to a helicoidal surface, or a vault is constructed beneath them. In the first case are formed wedge shaped prisms, with moulded edges or with surfaces decorated by sunk panels. In the second case the helicoidal surface may be ornamented by sunk panels, mouldings or ornaments arranged with reference to a helical line, or lastly a combination of the two varieties may be employed. In case of a vault beneath winding stairs, it may be divided in radial compartments; or may be an ascending annular helicoidal vault. The last arrangement permits pretty modes of treatment in brick construction with the aid of ornamental bonds, which were particular favorites in the brick architecture of Holland.

If the newel of a winding stairs is solid, it should have a hand rail moulding (Fig. 399), which must be of such form as to be easily grasped, and it is therefore usually a round between two hollows. If there is no newel, but a central well opening, this should generally be enclosed by an ascending helical string, moulded or decorated, and which is wrought in the solid on the ends of the steps. In larger winding stairs, this should be supported by small columns, very fine examples of which are found in the stair tower of the castle of Meissen, and in the graceful winding stairs of the so-called Woman's House at Strassburg in Alsace.

Very grand winding stairs should have a stairway separate for servants instead of a newel, which may be lighted by windows, so that an opportunity is obtained for decorating the walls of winding stairs by niches, tracery and similar motives.

6. Towers.

Towers are either intended for stairs, for observation, or for bells. In all these cases they have an upper story essentially different from the lower stories; the upper landing of a stair tower is lighted by a window, as well as the entrance to the attic story, or to any other room. Towers for observation or of fortifications serve for temporary or permanent occupation. Bell towers contain a room for the bells. Church towers are either detached, adjoining, placed over the crossing, or are little towers on gables. The latter are also used in buildings that require signal bells, like hospitals, barracks etc.

α. Plans of Towers.

As for the plans of towers, they are either free on three sides and then projecting beyond the face of the building, or they are built in and are merely free on two sides or but one; the square plan is preferable. Towers may further be circular or polygonal, with three, four, five six or eight sides. The form of plan is decided by the purpose of the tower, and by the place at which it is connected to the building. Wholly detached towers are seldom placed near a building except when independent, like observation towers; but they may be arranged to be partially free, as they may be connected with the lower story of a building by an arch, above which they are separate.

Stair towers should always be attached at one side or stand in the angle of a building. They should generally be treated plainly, being subordinate parts of the building, should have small windows, and only their upper stories should be richly treated and have large windows. If they play a more important part, their openings should be more numerous, and they should be lighted by larger windows. In many cases a gallery supported by corbelling or other supports extends around them at the height of one or more landings. The string courses should be stepped corresponding to the stair inside, or they should be arranged horizontally and placed at the same heights as the stories and the window projections. One or the other arrangement is preferable according to the particular case.

β. Towers for Observation.

Such may be entirely free or may be attached, partly containing stairs, the uppermost part being furnished with gallery,

balconies and similar expedients for facilitating observation. Church towers are frequently also for observation, especially when they serve as stations for fire watchmen. They then have a special story fitted as a dwelling for the watchman, where the watch is kept during the night. Such a story produces a special effect on the entire tower.

γ. Bell Towers.

These are essential requisites for churches. Their most important portion is a room for the bells, which must have as large or as many openings as possible, so that the sound of the bells may be heard at a great distance. Their character is also determined by their purposes. The towers of churches are usually intended for quite different purposes. For example, a tower may contain a vestibule in the ground story, an organ gallery in the second, a room for the clock in the third, a room for bells in the fourth (bells and clock must never be in the same tower), and one for watchmen in the fifth. This would require a tower in five stories with different heights and differently treated. In contrast to the open story for bells, the other stories are to be as nearly closed as possible, unnecessary openings being avoided.

For churches with nave and transepts, the crossing affords opportunity for a large tower, that may be a bell tower, may light the crossing, or be for observation only. In these cases it may have as many and as large openings as possible. Its form of plan depends on its purpose in the entire design of the church, and what esthetic and material parts it plays.

Town halls should have a tower in many cases, whose lower rooms may contain archives and an open balcony, etc., while in its upper part may be a clock and bell for the hours, and a room for a fire watchman. The tower story of the tower is often at the same time the city jail. The form of the tower is varied according to circumstances, but being for secular purposes, all ecclesiastical character must always be avoided. The same is true of towers for observation, those of prisons, city gates, bridges, chateaus and fortresses. A fortress character is more suitable for these with decorations by battlements, bays, etc., to produce a picturesque effect.

δ. Roofs of Towers.

The most necessary factor in the treatment of the tower is

the roof; towers may have wooden roofs, stone spires, or iron roofs; they may terminate with domical, pyramidal or conical forms. A crowning form may be produced by combining these forms.

The treatment of the roofs of towers is one of the most fruitful and welcome problems for the architect in all cases. The elements available for the purpose are:- 1, open galleries with columns; the so-called dwarf galleries; 2, dormer windows; 3, forms of gables; 4, placing masses at the angles; 5, several galleries above each other; 6, the roof itself, whether it be a dome, a hip or a conical roof; 7, corbelling out bay windows; balconies and galleries with balustrades; 8, gargoyles, finials of all kinds, weathercocks, crosses, and other ornaments for the apexes of towers. The most varied treatment results from the combination of these elements.

C. ROOFS.

Roofs are generally of decided importance in the external effect of buildings and structures, since they materially aid in forming the visible outlines. Therefore sound artistic feeling led the Greeks, no less than the mediæval masters, to lay the greatest stress on the treatment of the roof. Less attention was paid by Renaissance masters to the forms of roofs, with the exception of the domed roofs of churches, and thus in our time this tendency of the Renaissance is aimed at by many architects, to allow the roof to have the least possible part in the effect of the building, by concealing it behind an attic, or by making it so flat, that it cannot be seen. There is missed a rational development of the roof less in Italy; where wood is not abundant there and snow is hardly seen, flat roofs are the only appropriate way, and are actually necessary for sake of economy. It is otherwise in our North, rich in both wood and snow. The entire northern nature requires the perpendicular lines of our buildings to be emphasized by the roofs; here rich in forests, the cities would seem to have been burned, if the buildings did not have their powerfully effective roofs, with all their accessories of dormers, chimneys, etc. Therefore care must be taken, that the roofs are artistically treated to enhance the entire architecture, not to disturb it. It should not appear as if the architect could not design anything above the main cornice. Magnificent buildings like the former court theatre in Dresden, require something more than a

formless and colossal roof with lightning rods. Among its animated surroundings with the outlines of the court church and of the palace with its tower, the heavy mass of the former theatre appeared very badly. Among the many noble buildings, which occupy the Ring street in Vienna, the Town Hall with its well developed roofs appears far more advantageously than the new Museums, that look as if they had been burned.

We shall now treat in detail the following.

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| 1. Batter of walls. | 2. Forms of roofs. |
| 3. Roof covering. | 4. Corner windows. |
| 5. Ridge towers. | 6. Chimneys. |
| 7. Decorations of roofs. | 8. Gables and pediments. |
1. Batter of walls.

Enclosing walls are properly battered, that rain water may flow off on that side where it would be least injurious, that would usually be the exterior toward the street, where means of removing the water are usually provided. In this case it is proper to add a drip to the battering side of the wall. The same is true for battlements.

If it is required to prevent all persons from passing over the wall, a cresting or iron lattice will be suitable, and may be made of very pleasing form. It will also sometimes be necessary to give the top of the wall a richer form, so as to make separate parts of different heights, and to animate the wall by means of windows, vases of flowers, as well as by iron lattices and similar expedients.

2. Forms of roofs.

The principal forms of roofs are the shed roof, hip roof, gable roof, and the pyramidal hip roof. Composite forms may be used as required. Thus a gable roof may be hipped at both ends, or a gable or hip roof may join another gable or hip roof, a favorite for the roofs of towers. The inclination of roofs will frequently vary to produce better effects, for example, so that the ends of a hip roof may be steeper than its sides.

At the present time it often becomes necessary to employ the mansard roof and for the angle pavilions of public buildings, the curved mansard. These forms of roofs are entirely appropriate where resulting from needs. In the same way for sake of economy, it may frequently become necessary to lessen the height

of the roof by placing a deck above a straight roof.

On esthetic grounds, roofs composed of curved surfaces should also be employed, as for pavilions and conservatories.

In all cases the proportions and forms of roofs are to be chosen to add to the effect of the building. If a space for passage is arranged above the main cornice with balustrades, these should never exceed 3.28 to 3.61 ft. in height; high balustrades make the building appear low and low ones high. The balustrades can scarcely be lower than 3 ft., since their purpose would not then be fulfilled. If these balustrades are arranged in connection with pedestals supporting statues, these must be designed to produce a suitable sky line.

3. Roof Covering.

Care must be taken that the roof covering not only fulfils its purpose, but also has a pleasing effect. Even thatched roofs of straw may be made pleasing by the way in which the bundles of straw are fastened. The roof covering of rural buildings generally has a picturesque effect from accidental circumstances of all kinds; sometimes composed of stone slabs of irregular form, as in places where plates of porphyry or of Jura limestone are used; sometimes of shingles held down by stones. Moss and all kinds of plants which grow on roofs frequently appear very picturesque, although this growth is not beneficial to the woodwork of the roof. By cutting the lower ends of shingles are formed many kinds of patterns on shingle roofs, but care is necessary that the shingles be made of such forms, that water may be kept as far from the joints as possible.

Tile roofs take different forms according to the mode of laying, single, double or crown, also when the vertical joints are continuous or alternate, whether the tiles are set in bond, as in the last case. The forms of tile roofs further depend on the form of the lower ends of the tiles, as well as whether any tiles of special patterns are used.

The ridge and eaves of the roof always require special precautions to prevent entrance of rain water, and to properly carry it off. These places also demand ornamentation for any covering of the roof. Hence borders of differently colored tiles should be arranged along the upper and lower edges of tile roofs in patterns with ridge tiles of special shapes, or suitable

finials at the apex of the roof, that are to be treated as free ending forms. (Tectonics, p. 195 et seq).

In case of slate roofs, the most picturesque effect is obtained by the use of the old so-called German method of laying. By the use of slates cut to special forms are produced the most varied patterns, which may further be heightened by employing slates of different colors. Borders along the ridge and eaves and bands around dormers are always decorations peculiarly suited to roof surfaces. The ridges of slate roofs are most properly covered with metal, and crestings of perforated plates, of hammered work, or of cast lead and zinc or wrought iron, are always proper, as well as finials of these metals.

4. Dormer Windows.

In many cases a kind of story is arranged in the roof, especially in mansard roofs, which is lighted by large windows. These may be very richly and ornamentally treated. They generally consist of an architrave between pilasters, which support an entablature and pediment, and its base can be extended by volutes at each side (Fig. 400 a, b, c, d; Fig. 401, a, b, c). They may be then properly grouped with the windows of the upper story.

Large dormer windows are sometimes required by the need of hoisting weights by a crane when in a warehouse. They then have a strongly projecting roof in which the crane is fixed, and are closed by doors. These are decorated by wrought iron bands. Dormer windows usually serve for lighting and ventilating an attic; according to the importance or subordination of the part played by them, they may be decorated by ornamental gable roofs or left plain. Wooden gable roof of church towers are often decorative expedients of prime importance, and they may be connected together to facilitate fastening the ropes require in slaters' work. Dormer windows of houses and of public buildings may sometimes be circular, semicircular or elliptical, or generally may be of the most diverse forms. They should have an architrave and some form of cresting, frequently made of sheet zinc. Dormer and roof windows always add much to the decorative effect of a building.

5. Chimneys.

In a fully developed architectural style, one must not forget to make the chimneys of pleasing form, and to arrange them so

so that the effect of the building may not be injured. They should then have bases with caps at their tops for the discharge of smoke. The form of this cap always depends on its special mode of construction. It is proper to give the chimney a twisted shape as well as to combine several flues in a group, covering the whole with a roof of sheet metal to keep out rain. This roof may be decorated by small gables or have the form of a crown.

6. Decorations of Roofs.

Among the decorations of roofs, the cresting is here specially considered, and it may be executed in wrought iron, cast zinc or hammered sheet copper, and it is generally arranged as a cresting on the ridge of the roof; then the finials are free ending forms of the same materials, in the shape of sprays of flowers and leaves, decorated by weathercocks, crosses, animals and all sorts of forms, ornamenting the angles of roofs and especially the towers. Few general principles may be given for crestings and finials, since the greatest freedom is admissible in their treatment. They produce the most pleasing effect if they are partly painted black, partly gilded, and by their green appearance afford the most beneficial contrast to the massive character of the roof surfaces.

7. Pediment or Gable.

These form the end surfaces of gable roofs, and are either closed as in antique temples, then being decorated by sculptures or opened by windows of circular or other forms, which light the interior of the roof; they may be closed by an open stairway, so that one long side of the building is connected with the other as in some Etruscan churches. In houses and palaces, the attic frequently contains one or more rooms and then has windows; these are sometimes decorated in the richest manner and are divided in several stories. Their outlines consist of the two inclined lines with the same slope as the roof, or these are stepped to appear as battlements; from the latter were derived the richly decorated gables of the German Renaissance, by the aid of ornaments, accessories of all kinds.

The most natural mode of decoration is to make the two ends and the centre most prominent by acroterias and sculptures; all modes of loading the ends heighten the apparent stability, although seldom really increasing it, and the acroteria at the

centre satisfies an esthetic need. In very high gables, as in those of churches, these free ending forms require a proportionate height; gable crosses, finials, figures and similar motives may then be employed. The gable is covered by a cornice, that may be ornamented by crockets in some cases, like those of the Gothic style, or may be resolved into free and fanciful forms as in the German Renaissance. Both are justifiable for buildings of earnest and dignified appearance, churches, museums, opera houses, etc.; the second for those intended to have a character of greater magnificence, for chateaus, theatres, comic operas etc.

H. STONE CONSTRUCTION.

This is the most monumental and worthy expression of architecture, and at the same time is the most expensive mode of construction. The true historical development of architecture was carried out in stone construction; those in brick and wood only approximated ~~it~~ in other materials, to the forms and motives already existing in stone construction. It is indeed true that in different places, stone construction was first developed from wood construction, borrowing from thence a part of its forms, like those of the entablature, columns and gable roof; but the further development of these and other elements first occurred in stone construction, as well as the determination of esthetic proportions. The resistance of stone to crushing and transverse breaking prescribed the limits within which stonework could be employed; resistance to tension almost never comes in consideration, or only as it may occur in a beam under transverse stress. The elements of stone construction are always monolithic beams of stone, posts, slabs, ashlar and voussoirs of arches and vaults. All architectural construction is arranged with reference to these. Although a greater firmness is given to stonework by the use of mortar, it must itself be so arranged, that the different parts of the structure are in a state of stable equilibrium. It is always characteristic of stone construction, that the elements of its structure always remain within certain limits, depending on the thickness of the layers of stone in the quarry, and that considerable projection is possible for cornices, and further, that the mode of cutting also aids the effect.

With reference to this, see Tectonics, p. 117, etc.

Further, the use of different qualities of stone may strongly characterize stone construction. The harder stones should then be employed for the structural parts and the softer for the mass of the walls. In this way, the water tables, string courses and cornices, architraves of openings in walls, supports and the remaining cut stone work will be sharply distinguished from the masonry proper. This is also true of walls plastered externally, or if stones of equal hardness and strength but of different colors, for example red and white sandstones are employed in a structure. The rarer kind of stone should then be used for the architectural details proper, and the more common for the masonry. This further depends on the ease of working the stone or on the texture of the material. If two kinds of stone are equally hard, like red and white sandstones, one should decide in accordance with the character of the building which should predominate. Red sandstone used in mass gives the building an earnest and gloomy character; which has a cheerful and brighter one. The darker stone requires coarser forms than the lighter one. Tectonics, p. 182.

I. BRICK CONSTRUCTION.

In regard to the treatment of form in this construction, everything necessary has already been said in the Chapter of Tectonics on Bricks, p. 134 etc. In general and as a whole, the character of brick construction is determined by the small dimensions of the elements, by the intimate connection of the mass, and by the slight projection of string courses and cornices. It therefore always produces works that are massive, have small members and relatively low relief. Two styles have been developed in brick construction, the northern mediaeval brick architecture of the low northern plains, to which are allied the south Slavonian, lower Slavonian and Dutch, and the brick architecture of upper Italy. The first style may be called brick architecture with moulded bricks, the second is that employing terra cotta. The northern style scarcely used terra cotta, which was a great favorite in that of upper Italy. Both styles lead to peculiar forms and both may be combined, or rather are already combined mostly in the brick architecture of upper Italy, since this style used both moulded bricks and terra cotta.

the difference between moulded bricks and terra cotta consists in this, that the latter is modeled, cast or pressed in moulds, and therefore admits of plate forms, such as parts of friezes, and freely sculptured ornaments, while moulded bricks are properly only profiled bricks, so that the first style renounces nearly all ornamental and sculptured ornamentation. On the other hand, the first style employs glazed and colored bricks, rarely ornamental blocks carved from sundried clay and burned.

However pleasing the works created by the northern mediaeval and the Lombard or Sienese brick architecture, without improved transportation a pure brick architecture excluding all stone will now be advisable only in some localities. But where cut stone may readily be obtained, it will usually be preferred to bricks, these being only used for the masonry.

K. MIXED STONE AND BRICK MASONRY.

In countries where brick is the ordinary building material and where sufficient cut stone may be obtained for the principal architectural details, a mixed stone and brick construction will be employed, like that found generally in the Netherlands, and there developed in a wholly specific way. At least there all the strong courses and cornices are made of cut stone, and blocks of stone are built in at the openings, wherever iron anchors are to be fixed for the wooden doors or window frames.

In a more developed form of this mixed construction, the brickwork is entirely limited to the masonry or wall, and the jambs of doors and windows as well as all other structural parts are made of cut stone. On the other hand, pilasters for strengthening the wall may be of brick on account of the stronger bond, while their capitals and bases are of cut stone. In case of isolated piers, it is best to interrupt the brickwork at regular intervals by cut bond stones to give greater strength.

The mixed brick and stone architecture of many Dutch buildings of the middle ages and the Renaissance is really refined, and in it is a certain intention of producing a special effect by the contrast of colors of white sandstone and deep red bricks. No opportunity is lost for decorating springing and key stones, or for interrupting brick masonry by courses of stone placed at the same height as window sills or transoms (Fig. 402), so

that the brick masonry forms closed panels. These expedients give the mixed stone and brick architecture of Holland its peculiar stamp, and they form the readiest and simplest general means of obtaining a characteristic effect with small means, especially in buildings intended merely for utility, as in rural structures.

WOOD CONSTRUCTION.

Wooden houses are either built of logs or are half timbered. Compare what has been said of wooden walls under A. 4. B. and also in the Chapter of Tectonics on Woods, p. 139.

Since in wood construction not only the resistance of the structure to compression and transverse stress, but also to tension is exerted, elementary structural forms result entirely different from those used in stone construction. Horizontal beams subject to transverse stress are beams, sills, purlins and straining beams. Vertical supports are posts, inclined ones being struts and braces, all subject to compression. Horizontal timbers in tension are tiebeams, and vertical ones are king or queen posts. For the forms of these structural elements, reference is made to the Chapter of Tectonics on symbolic forms, p. 122. The most fully developed wooden architecture with which we are acquainted is that represented by Swiss and Tyrolean houses, formerly mostly built of logs, lately with a timber frame lined inside. The strongly projecting gable roof, open galleries, low stories with numerous windows, lend to these wooden houses their characteristic appearance, that varies in the most different ways in each separate structure by means of carvings of all kinds, due to the abundance of wood in Alpine countries.

The remaining wooden architecture of Germany chiefly uses half timber construction, the interspaces being filled with brickwork; a projection of each story beyond that next below, and the steep gable roofs, characterize these houses, which are best adapted to the North. These half timber buildings with panes of brickwork, either plain or plastered, acquire a peculiarly pleasing appearance when the decorative brick bonds are employed.

M. MIXED WOOD AND STONE CONSTRUCTION.

Whatever may be said here was stated in general in relation

to the half timber work just mentioned. In many cases the basement story has a plain wall, especially if the upper story is half timbered. The external appearance of the building then depends on the materials and mode of construction used, as well as on the painting, sgraffito, ornaments in wrought iron, overlays of tiles, etc. Evidently neither pure wooden architecture nor mixed construction in stone and wood are suitable for monumental buildings, but both are better adapted to country dwellings, modest city houses or rural structures, etc.

This mixed style is well suited for small railway stations, foresters' houses, country inns, all the structures attached to the drinking room at baths and spas, and a peculiar character should be given to these to correspond to local conditions. This mixed style in purely wooden architecture will likewise be employed for temporary structures, for festivals and in general for those satisfying temporary purposes, after which they are to be removed.

N. METAL CONSTRUCTION.

In this only city buildings of wrought or cast iron require consideration. On account of the cost of bronze it was hardly used except in the classic period, and then but exceptionally as a special structural material. On the contrary, iron plays an important part in modern architectural construction.

The most extensive use of iron occurs in railway stations, buildings for international exhibitions, bridges and roof trusses. In accordance with the resistance of iron, all structures of it should have a character of lightness; compression is chiefly resisted by columns and struts of cast or wrought iron, transverse stress by iron girders and beams, tension by wrought bars or rods. The walls and roofs are mostly composed of thin sheets, when not built of masonry or wood in combination with iron, or even of glass. The general character of lightness possessed by iron buildings results from an endeavor for economy of material and labor, which requires each part to have the smallest dimensions possible. Therefore the stronger the structure, the less attention should be paid to its external artistic appearance, and it should be left to produce its own effect. In case of small structures, little pavilions, garden houses, etc., or railway stations, care must be taken

to decorate parts in cast iron and also to use wrought iron ornaments of all kinds. The same is true for fences, latticed gates, monuments, canopies over wells and similar objects. Perforated and hollow forms are suitable for cast iron, thin plates, bars and rods for wrought iron. General laws stated on p. 150, 154 and 164 of *Tectonics* are valid for iron and its uses.

O- MIXED IRON, STONE AND WOOD CONSTRUCTION.

In many cases a structure may be partly of stone, wood and iron; thus very large rooms have walls of masonry, the roof is of iron, and wood is used to receive the covering material. Each material is used in such structures and the massive masonry pleasingly contrasts with the light and graceful forms of the ironwork. For example, massive stone bridge portals have a better effect than if made of cast iron, since casting must avoid a massive character; hence buildings for exhibitions, conservatories and similar structures are more pleasing, if partly of masonry, than if entirely made of glass and iron.

F. ARRANGEMENT OF PLAN.

Every arrangement of the plan results from division or addition, a given area being either divided into parts, or such parts are arranged together.

A series of rooms are placed next the facade of a house, between two adjacent dwellings, and the remaining rooms adjoin the former. In a detached house, a villa, we commence with the largest rooms, drawing or living room, and the others are placed with reference to them. In the first case, the plan is made from front to rear of the building; in the second the interior is first grouped and then the exterior is arranged. If the house occupies a corner, two series of rooms are placed along its fronts, either leaving the principal room at the angle, or the corner is divided in smaller rooms, as may best accord with the requirements. A series of principal rooms should always extend along the principal facades of public buildings, unless the structure is to be treated as a large hall, when the others are to be grouped around the hall. A corridor is often placed behind this series of chief rooms by which the rooms are made accessible. Therefore in public buildings the arrangement will progress from front to rear, but in hall buildings comprising theatres and churches, it will be from interior to exterior.

In order to make the best use of the site, the plan is always to be arranged, so that the corridors may occupy as little area as possible; but in many buildings like schools, the corridors not only serve for access to the rooms, but are also occupied by pupils in intervals between classes, as well as for reception of cases containing books, models, collections, etc.; they then assume a greater importance, which has an influence on the plan. Space is always lost by vestibules, stairs, passages, etc., therefore one should arrange to make this loss as little as possible, and in very large public buildings, the loss of time must be considered, resulting from the connection of the different wings of the building by corridors, courts etc. Hence one should arrange near each other rooms properly belonging together, and to make their connection more direct by means of private stairs, corridors, etc. He should further try to make vestibules, corridors and courts as useful as possible, to serve for temporary occupancy by men, therefore arranging light courts with glass roofs, galleries of all kinds and loggias as may be required. This comprises the things of most importance that may be said of arrangement of plans.

C. SECTIONS OF BUILDINGS.

If heights of stories are fixed, the cross sections of buildings are controlled by the arrangement of the plans. The essential part of modern architecture relating to the section is, that only in exceptional cases resulting from the form of the site or from special purposes, is any story not arranged throughout on the same level, as the case in so many mediæval buildings. Yet in exceptional cases, when peculiar arrangements make it necessary, some halls are made lower or higher than a story, thus extending either below or above it. When the conditions of the site are peculiar, as in mountain cities or castles, the accidental location of a site usually produces very peculiar arrangements of stories, where one must strive to make the best use of those conditions of the ground. Thus it may well become necessary to abandon all rules and take into account the special cases. But one should be careful to place as many rooms as possible on the same level, and to retain the heights of stories decided upon.

D. FACADES AND COURT FACADES.

F. FACADES AND COURT FACADES.

The facade is essentially derived from the plan and the section. The openings for doors and windows, porticos, loggias, towers, etc., principally determine the arrangement of the facade, the purpose and importance of the building, and the detail forms of the facade. Characterization requires not only that the exterior is the result of the interior, but that it may correspond in every respect to the destined purpose of the structure. Therefore the choice of building materials and structural forms must be in strict accord with this determination.

Facades of courts are generally of subordinate character; yet in many cases the courts are developed into magnificent architectural works. The courts may be decorated by galleries, loggias, stairs and stair towers, bay windows and balconies, niches, water works and fountains, in brief, by any means of decoration. But it is to be remembered that a court must appear well from the most distant point of view possible, and that according to whether the court encloses a garden or affords a fine view, its arrangement must be such as to utilize these advantages as fully as possible.

G. KINDS OF BUILDINGS.

In describing the kinds of buildings, we shall here follow the order employed in *Lehrkunde des Architekten*, Vol. II.

1. Agricultural Buildings.

These are to be regarded as being equivalent to a capital paying no interest. They must therefore be constructed as economically as possible, using the local and cheapest materials and structural methods. Hence their character is determined by plainness, neat appearance, and by the decoration of their natural surroundings, or by cultivated vegetation.

Their arrangement and grouping varies in accordance with their special conditions. If they are connected with peasants' cottages and farmhouses, the local character will decide their external appearance. But if they are to be considered as dependencies of the estates of noblemen, a greater expenditure in their erection will be appropriate according to the means of the owner; then in case of the existence of a prevailing rural type, they assume a more civilized character, so to speak; still it must always be avoided to permit them to closely approach the appearance of city buildings; they should remain rural structures.

Even in cities, agricultural buildings attached to the seats of noblemen, castles and palaces, should not exceed a certain modesty in their external appearance. This limit of permissible type and propriety will be fixed by the means of the owner, and the instinctive feeling of the architect.

As for these, so for all kinds of manufactories in general is suited a plain and unimportant character. Like the workman in working clothes, all such structures should be modest in appearance. All expenditures beyond absolute necessity and an appearance of neatness is best avoided, the money being better if expended for the benefit of the workmen.

Yet designs for factories, by special requirements and conditions, afford opportunity for employing peculiar though simple architectural forms, and require a careful choice of them on account of their modest character, so that it is easy to recognize the intention to make these buildings pleasing at a moderate cost.

Country seats of noblemen not having the rank of villas, but containing both the dwelling and the farm buildings of the owner, should be treated as plainly as possible, so that all possible capital may be placed in the business itself. They usually contain in a higher ground story the living rooms and farm buildings, in a lower upper story being the bedrooms and the rooms for strangers. Solid construction and appearance, as well as simplicity are the chief requirements of this class of buildings. Pleasant surroundings by gardens and parks are the chief means of decoration worthy of endeavor.

Buildings for the forestry service are similar to those for agricultural purposes, and are subject to similar requirements in relation to external appearance. A rural character is advisable for these also, and an adaptation to local conditions, so all is to be avoided, that might give them a cityfied look.

2. City Houses.

These are separate dwellings for single families, whether for workmen, villas or palaces; or they are houses for rental and containing one or more flats in each story. They are further detached or are built in blocks, i.e., free on all sides, or are in rows and then are free on two or three sides only. The degree of external appearance and decoration depends on their

importance and size. Solid construction should first be required, if the greatest propriety is to be exerted, and all imitations of building materials are therefore excluded, all structural parts being of stone or brick, using plaster only in the interiors. A house should not appear more than it is. If the occupier can afford to rent an entire building, he can also afford a solid style of architecture; should he possess less means, he must then decide to live without decoration. If the house is for rental, the tenant must pay for the decoration in his rent, and thus pays for things that make him no return. This ground law of solid construction would materially simplify our entire city architecture, if carried out to its extreme results, which would be a great gain. For it would first compel us to economize materials, and secondly would cause us to learn to exercise the greatest economy in the use of our artistic expedients, without which economy is impossible a sound architectural style: Not richness is first to be considered in a house, but a refined appearance suited to the rank of the occupant. This refined appearance first requires solidity, without which there can be no real magnificence. Everything not genuine or that is imitative lessens this refinement.

The plan of a house first depends on the means to be expended, especially on whether all rooms are to be on the ground floor, or are to be divided among several stories. A house becomes cheaper, the smaller the area of ground covered by it, and the narrower its facade. It will therefore usually be preferable to occupy more than a single story in practice, if the house contains a single dwelling. If the house is in a block, it will be cheapest if narrow. In large cities where ground is very dear, each house becomes high and narrow, containing three or four stories, each with at least one flat. The entire external appearance is then arranged in accordance therewith. Even in houses for rental, occupied by several families, it is usual in many cases for each to live in two stories, for example at Amsterdam. Such a house would then require four stories for two families. The external decoration of the house is always arranged in accordance with the plan; therefore effectively grouped plans should be avoided, unless the owner has the means for also effectively treating the building.

A principal requirement for villas is to obtain as large an area of wall surface as possible for the reception of furniture, consequently not putting in more windows than are necessary to light the rooms. Hence in many cases an external wall is arranged without windows. Esthetic needs may require this wall to be decorated to not appear monotonous, but one should not resort to the cheap and senseless expedient of arranging blind windows. Picturesquely grouped villa plans with projections and recessions chiefly result from the general location, whether they are connected with gardens, look out on fine views, and further according to the site, which usually demands a picturesque grouping. The building may then be treated by means of loggias, bay windows, stair towers, verandahs, and like means.

If houses for rental are detached, to reduce the area of ground occupied and the width of facade as much as possible without lessening the requirements of the rooms, an approximately square plan will be preferable, since the square has the smallest perimeter for its area, except the circle. These plans usually result from rectangular sites, if the facades are limited to a minimum in proportion to the area of ground covered, for in case of an equilateral triangle its perimeter is more.

The richer and more extended are the plans of villas and of palaces, the more refined should be their external appearance; if it is desired to reduce their cost to a minimum and to build as quickly as possible, making the building habitable in the least time, one returns to the old Florentine type with rustic masonry and the simplest arched windows. If it be desired to adhere to the ground law of solidity with the greatest economy, as in the great houses for rental, in modern cities one resorts to the type of the Roman palace with details of stone and walls plastered externally. These are the limits within which the designs for the largest palaces must lie, while these palaces are for private persons. Princely, royal and imperial palaces, as well as that of the president of a republic, governor, etc., very far surpass these limits, since their chateaus and palaces are intended for their successors, while private persons usually build for themselves and their families. There are naturally many other factors that influence the character of palaces, but besides the building materials employed and the magnitude of

the palace, the principal one is the time allowed for their completion, which can only be reduced within certain limits. Hence with smaller dimensions a relatively richer treatment of palace architecture becomes possible.

The principal difference between palaces and public buildings is in their character as dwellings, chiefly indicated by the treatment of their windows.

Evidently the most varied modes of treating houses are possible in other respects, according to the requirements in special cases. These will always produce certain results according to the way in which they are combined. Thus in different countries for satisfying different human needs, the expedients of the architecture of houses and palaces take different characters. The modes of life of different races, the materials at their disposal, the rank attained by the architectural development, the climatic conditions, the abundance of a circulating medium, material wealth, and other factors, will decide the treatment of dwellings. Even the frequency of natural occurrences, earthquakes and inundations, storms and tempests, snow and rain, etc., will influence the character of houses, as well as the local situation, conditions of the site, and the need of greater or lesser durability.

The "tooth of time" then does the rest necessary to change the appearance of the building, and to change the splendor of newness for the venerable appearance of the historical.

3. Churches.

In churches all should be avoided which recalls secular architecture. They are buildings for the exercise of Christian worship, and we need only to consider the evangelical and Catholic confessions. The evangelical church only recognizes parish churches in cities and villages, and chapels like those found in hospitals, prisons, etc.

The Catholic church requires :- a, bishop's churches, cathedrals or minsters; b, collegiate and abbey churches; c, parish churches; d, pilgrimage churches; e, votive, cemetery chapels, mausoleums.

The arrangement of the church must always be suited to the average number of attendants, which by investigation amounts to 55 per cent of the population, of which $\frac{4}{5}$ are adults and

1/5 children in round numbers; afterwards to the special needs of the church which are:- a, the choir for the clergy; b, the nave for the audience; c, the sacristy; d, the tower; e, the necessary vestibule, baptistery, rooms for instruction, for records, and for servants of all kinds.

The plan of the church should either be arranged about a centre, be oblong, or according to the Greek cross of equal arms, according to the Latin cross of unequal arms; the plan may be modified in most diverse ways by use of transepts, vestibules, additions to choir, chapels, as well as by location of the towers, and finally by the forms of these elements. From its plan with one or more aisles and the combination of plan and section, producing a hall church with aisles of equal height, a church with higher middle aisle, or finally a basilican design lighted by windows high up in the side walls, results the external masses of the building, modified in some cases by the towers, sacristies, chapels, galleries and triforiums, by treatment of the roofs and of the rather subordinate gables, dormers and ridge turrets. The interior will vary with the construction of the ceiling and the supports, also with the distribution of the light and the treatment of the windows.

Under all circumstances the most dignified and monumental effect conceivable in the case is to be striven for, in both interior and exterior of the building. Therefore external plastering of walls is only advisable in case of absolute necessity. If strict economy is needed, a building arranged on the central plan will require less enclosing wall for equal area than a cross shaped plan. Yet in the most favorable case of a circular plan, the length of wall would be only about 1/10 less than that for a square plan of equal area. Hence the gain would not be great. From its considerable volume, a church always requires a certain height corresponding to its area, especially if vaulted, and this chiefly depends on the span. In this way by its considerable extent, the church always predominates over other buildings, and the grandeur of its masses always demands a certain grandeur in the architectural forms, which must be chosen according to each special case. To go into details of church architecture belongs to the developed theory of building, which it is not proposed to treat here. It is now sufficient

to note a few essential points, that determine the specific character of churches as differing from other buildings. The most essential portion is the treatment of church towers and roofs on which a special value is laid. The richness of the treatment should accord with the importance of the church, and depends on quality of materials, variety of architectural forms, as well as the ornaments and statuary. Except in rare cases, a certain limit in decoration is not easily exceeded at this time; the era of great cathedrals lies behind us, hence one must strive to produce the desired effect by the power and originality of the architectural motives, making the details noble and dignified, but renouncing all elaboration in details.

4. Cemeteries.

Modern cemeteries are either parks or architecturally treated burial places surrounded by porticos with some necessary buildings at the principal entrance. Since they are most properly at some distance from cities and on elevations, their landscape surroundings usually aid and increase the solemn gravity required. The burial places are common trenches, separate graves, tombs and family tombs. The great burial field serves for the first use, while the tombs are arranged in the surrounding porticos. On account of the great extent of cemeteries and the low height of the enclosing buildings, it is desirable for aesthetic reasons to break up and dignify the long porticos by structures like chapels at their centres and angles. It is very suitable to arrange the larger monuments and mausoleums to form streets of tombs after the classic method. Porches at the entrances of the porticos, a memorial hall, a chapel and buildings of all kinds near the principal entrance for diverse purposes and adapted to needs varying with local conditions, serve to decorate these cemeteries. It is always necessary to express the gravity and solemnity in their purpose in their architectural arrangement and decoration, and all must be avoided belonging to secular architecture. Structures connected with cemeteries are as follows:- portals, residence of superintendent, houses for hearses, chapel, offices for officials and physicians, dwellings for employees, foremen, excavators and gardeners, shops for sale of flowers, mortuary with dissecting room, crematory, wells, water closets, gardens, nurseries and conserva-

conservatories. To combine all necessary buildings in pleasing groups is the problem of the architect.

5. Synagogues.

These serve for Jewish worship; hence everything is to be avoided in them, that recalls the Christian church, and especially the cross plan. All essential elements of the synagogue will be named; vestibule, room for men, sanctuary, rooms for rabbi and chorister, women's room, stairways, wardrobes, hall for deputies and president, water closets and cellar. The spacious vestibule forms the principal entrance and gives access to the stairs leading to galleries for the women, and at the same time forms the chief part of the facade; this vestibule may remain entirely open. From it is entered the room for the men with seats extending from east to west. The sanctuary is a kind of choir requiring special arrangement for receiving the sacred writings in a fireproof vault, and requires artistic decoration. Rooms for the rabbi and chorister are toward the east. Women should always occupy galleries, that require two platform stairs at the west and the east in case of sittings for more than 600 women. For the given needs and the requirements of divine worship, the centrally arranged plan is a most suitable, or the ordinary basilican; the first being preferable by its overhead lighting, that can be obtained by a dome. Oppler rejects the Moorish style for the architectural treatment of the synagogue and recommends the prevailing style of the locality. Towers are only to be used for stairways. Representations of the human figure are generally excluded from the synagogue, only plant and geometrical forms being allowed with an inscribed frieze, and the crowning symbols of the tables of the law and the shield of David, the hexagram.

Strict regulations for construction of synagogues require them to be entirely built of cut stone and brick, excepting a cast iron in the interior and stone columns for supporting the galleries. Oppler also recommends monumental ceilings, i.e., vaults of all kinds as well as wooden ceilings with visible trusses, and monumental constructions for the roof with the use of copper as a covering material.

6. Jewish cemeteries.

These should be enclosed by monumental walls and be divided by rows of trees into sections containing rows of graves, the

intersections of the avenues being decorated by fountains. The inner sides of the enclosing walls are occupied by family tombs.

The entrance to the cemetery, with all side doors for persons on foot, opens into a court, whose longer side is occupied by the hall for religious services, the buildings on the other sides serving for the guards of the cemetery and for religious purposes. These comprise a room for prayers extending from west to east, as well as a room for washing the bodies. The room for prayers must open directly on the court. The hall must also extend from west to east and requires wide doorways in the middle of its longer sides, through which the coffin is carried, and large windows extending down as low as possible, since the rabbi conduct the service from the outside, not being allowed to enter the hall. All these buildings must have a monumental and dignified appearance. (Eaukunde des Architekten. II. p. 270, 284, et seq.).

7. School buildings.

a. Primary schools.

Small school houses for primary and village schools must be solidly and simply constructed, monumentally treated when this can be done. It is always proper to so arrange the class rooms to admit the light only on the left hand side. The windows should extend up near the ceiling and be as numerous as possible, to admit abundant light to the class room. This determines the character of the building, that must contain many windows, these being grouped. A large hall is generally placed in the upper story and a gymnasium in the basement, if not in a separate structure. These parts should be externally distinguished from the others. Drawing rooms should be long and narrow with north light. Since school rooms differ much in form and location, there are usually projections and recessions in the building, which thereby obtains an animated appearance.

β. Higher schools.

For higher schools, gymnasias, real schools and higher girl's schools, a richer external appearance is desirable, suited to the means available, dimensions of the building and the higher work of the school. Solid construction is also here the first requirement, the exterior of the school should be as substantial as the instruction, there given. The hall requires larger

dimensions and therefore leads to a considerable enlargement in plan, and it should be artistically treated in the richest manner.

Y. High schools. (Secondary or professional).

Universities and polytechnic schools, academies of art and similar higher schools require the relatively highest decoration of the exterior according to their importance as institutions of learning. These buildings contain college lecture and class rooms, the great hall, roofs for officers and professors, museums, laboratories and studies. In recent times such buildings have been arranged as a connected series of buildings, so that the principal structure, besides the great hall and the offices, only contains lecture rooms and eventually the museums. All laboratories and special departments are placed in separate buildings. The hall and the larger lecture rooms generally cause a number of projections in the facade, since the building usually requires long corridors, the vestibules, stair halls and the great hall afford opportunity for a richer treatment of the central portion; the long museums, drawing rooms, etc., require a great deal of light and therefore produce rooms like halls with narrow piers between the windows, numerous large windows.

To not increase the area of ground needed, more than necessary, some portions of these institutions for higher instruction require more stories than the rest. Thus richly grouped and treated designs result from the natural requirements. It depends on the special circumstances, whether and how these buildings should be grouped around a court or be arranged in connection with a system of gardens. Gravity and dignity of character are always suitable for their external appearance, and we should therefore avoid treating them with the cheerful and luxuriant magnificence suited to palaces and opera houses.

A large number of kinds of buildings are arranged in the following classification, less on account of their special purposes, than for their similar requirements. These classes are as follows.

α. Buildings that chiefly consist of a principal hall with which are connected subordinate rooms of all kinds, comprising legislative buildings, concert halls, exchanges, buildings for festivals, theatres, halls for dancing.

β. Buildings chiefly composed of offices arranged around courts and that may be connected with a large principal hall. This comprises town halls, ministries, post offices, telegraph offices, criminal courts with the hall for jury trials, banks, casinos and buildings for societies.

γ. Buildings chiefly consist of several halls of medium size with smaller rooms, comprising museums, libraries, record offices, buildings for art exhibitions.

δ. Buildings contain no true hall but rooms of different sizes, that adjoin corridors and are connected with a chapel; benevolent institutions, hospitals, insane asylums, deaf and blind asylums, theological seminaries, prisons.

ε. Military buildings, barracks, headquarters, arsenals, guard houses.

ζ. Halls connected with rooms and smaller halls or without them, comprising large railway stations, market halls, produce exchanges, conservatories, buildings for industrial exhibitions.

η. Manufactories, mints, bronze foundries, abattoirs.

κ. Baths, observatories, aquariums, etc., cannot be placed in any class.

The buildings of any class have many things in common. The principal hall always extends in height through more than one story, is surrounded by galleries and boxes, adjoining it being buildings of one or two stories containing smaller halls, corridors and offices. These two story buildings may be grouped around courts. The hall then predominates over the rest of the building, whose ceiling requires a higher roof with lower wings, the lower stories being closed or with arcades with vestibules and stairways at their centres, as well as smaller halls in the upper story. The angles may be treated as pavilions, the courts being surrounded by porticos. For this group a special type is always developed in accordance with the special programme for the building.

3. Houses of parliament.

Houses of parliament where the state and the people are represented by the ministry and the deputies, require a dignified magnificence in accordance with the greatness of the realm by which they are erected. But their character should differ as much as possible from that of the palace of the ruler. Even

porticos, external stairs and towers, where bells are rung at opening and closing of sessions, convenient access and corridors are particularly adapted to these structures. The side wings containing the offices require a simpler treatment.

9. Concert halls.

These laways containing a large concert hall with galleries and boxes, which dominates the whole and requires a kind of basilican plan; vestibules, stairways, clothes rooms, promenade halls, restaurants for the public, halls for rehearsals with wardrobes and stairs for musicians, adjoin the principal hall. This usually produces an oblong building over which the hall must predominate. If these concert halls are connected with conservatories, they then require wings with rooms for instruction and administration, libraries, smaller music halls, rooms for servants, all these being arranged about one or two courts. The character of the concert hall should correspond to its purpose, which is enjoyment of ideal pleasures, and it should therefore be dignified, but graceful and cheerful. All symbolisms referring to music are therefore peculiarly suited to this purpose.

10. Halls for dancing.

These consist of a hall for dancing with galleries and smaller halls, clothes rooms, promenade rooms, restaurants and play rooms; gardens and conservatories are generally added. These buildings exclusively serve as pleasure resorts and should have a cheerful character. They require little of the monumental, but may be constructed of building materials of less durability, employing any mode of decoration suited to the needs of the time, and for playing apart in decorations for festivals.

Halls for festivals as usually erected in many modern cities nearly coincide in requirements with halls for dancing; in both must be provided a means of rapidly emptying the large hall in case of fire. Hence external galleries and numerous exits are desirable. Halls for festivals serve for the most diverse purposes of enjoyment and amusement, are often connected with extensive pleasure gardens, but differ from halls for dancing, because a much larger number of people must be provided for. The hall is also used for exhibitions and must dominate the entire mass of the building and be fully lighted, thus requiring skylights or windows in the upper portion of the side walls, and should also be fireproof if possible, while the hall for

dancing does not require lighting by windows, as it is generally used only with artificial light. In these buildings for festivals, as in those of class x, it is advisable for two reasons to arrange stairs in stair towers, because a clear idea of the arrangement of the stairs is easily remembered, and for the esthetic reason that the principal mass of the hall is contrasted with more slender masses of equal height.

11. Theatres.

These are dominated by the audience room and the stage. The audience room is generally semicircular, and its natural form should be expressed when possible. Vestibules, anterooms, foyers and principal stairways form a mass, which properly projects before the audience room with its galleries and boxes. All subordinate rooms are best placed in the side wings, that in exceptional cases include courts, as in the opera house in Vienna. The character of the theatre is that of dignity and grace, that of opera houses and comedy theatres is one of grace and cheerfulness. On account of the small durability resulting from danger of fire and the performances, attention should first be paid to securing the greatest safety possible. Monumental appearance is second as far as it corresponds to the dignity of the building. Therefore stone and iron construction play the chief parts, and wood should be used as little as possible, only where indispensable as in the stage construction. All materials of small durability but incombustible like sheet zinc, stucco and gypsum, may be used in the interior of the theatre with perfect propriety.

As stated in the preceding section for dancing halls, the arrangement of stairs in towers is proper for both practical and esthetic reasons.

Everything symbolical relating to dramatic art is evidently suitable as decoration. Gardens before the theatre, foyers and open porticos for the public, while awaiting the performances, are also appropriate.

12. Bank and office buildings.

Exchange buildings always require a great hall, which dominates the building, as well as a number of different business offices, with vestibule, stairways and other accessories. For their characterization as distinct from other buildings, all

emblems and symbols are suitable, that relate to business; in order not to impair their characteristics a certain measure of decoration should not be exceeded, and also solid construction should be more considered, and decoration by the use of valuable materials procurable in trade, than a rich and magnificent architectural style, better adapted to other buildings. Banks and exchange buildings are suited by an ostentatious character, most properly obtained by expensive materials.

The group of kinds of buildings arranged under β is characterized by being composed of a large number of similar rooms for like purposes and with a uniform character, only modified by prominence of vestibules, stairways and separate halls, mostly placed in the upper story, therefore higher than the wings. They are more nearly similar to school buildings, but only in exceptional cases do they require as many and as wide windows, excepting in the halls. Hence long rows of windows usually occur and the buildings have several stories, sometimes two or three stories besides the basement and mezzanine. A plainer character is suitable for offices, dwellings and rooms for other purposes, a richer treatment for the halls.

13. Town halls.

These contain the offices of the city government, and thus many offices. Besides they comprise a large hall for assemblies placed over the extensive vestibule, and also large and spacious stairways. In many cases a tower is added, as already stated, to contain a clock that strikes and also a bell for indicating the hour, with a room for the fire watchman.

The hall and tower require relatively richer decoration, thus giving the town hall its peculiar stamp. The offices need wide corridors, usually arranged around courts. A portico is placed over the vestibule with a balcony or open loggia opening out of the hall, to serve for announcements or for representations during festivals. These are then proper for the two lower stories of the tower.

14. Ministries, post offices, telegraph offices, courts.

Such buildings are almost entirely composed of offices arranged about courts and with corridors. They usually require several entrances and vestibules and sometimes several courts. Generally a richer mode of treatment should be rejected, and

one should be satisfied with a massive and solid style of architecture, which should be distinguished by the arms of the state, and any richer decorations should be concentrated on the portals.

15. Casinos, houses for clubs and societies.

Such buildings generally contain a hall for concerts and balls in the upper story, as well as a number of very different rooms, used for recreation and placed in the different stories. The external treatment corresponds to the means of the society by which it is erected, and therefore varies greatly. With the use of abundant means, we should try to characterize the hall on the exterior, also when these buildings are connected with gardens, to make them effective by terraces, verandahs, etc.

Hotels are allied to this class and are evidently arranged and treated in accordance with their location, size and rank. The dining room becomes the principal hall.

Buildings placed in class γ have many things in common, because they usually have no principal rooms except vestibules, that require to be distinguished above others. They generally need numerous and large windows, no windows in halls having skylights, may have corridor-like loggias, may be decorated by porticos, and require a noble external treatment according to their dignity.

16. Museums, libraries, record offices, art exhibitions.

Little may be said in general of plans of these buildings, as this depends on the magnitude of the collections placed in them; also on whether these buildings may or may not be grouped around courts, or whether they have one or more stories. A chief requisite is safety from fire, and on this ground alone, with reference to their noble purpose, they are monumental buildings of the first rank, and solid construction is not only suitable for them, but also decoration by sculptures and paintings. Record offices must be entirely fireproof, but do not need artistic treatment of exteriors as much as the other buildings of this group.

The character of museums will vary according to the objects collected and exhibited in them. Collections of paintings and statuary are highest and require the noblest treatment. Libraries are suited by a dignified appearance with decorations by

statues and busts of the principal authors and sculptures relating to the departments represented therein. Art museums should be decorated by portraits of artists and by symbolical representations of the arts; collections in natural history by portraits of men eminent in that science and representations of distant parts of the world; ethnographic collections by representations of foreign races of men, etc.

17. Hospitals, deaf and dumb asylums, theological seminaries, prisons.

These buildings grouped under δ have this in common, that they generally consist of many rooms of the same character, arranged around open courts with corridors or porticos. They are usually connected with a chapel, which affords opportunity for special treatment, while the other parts of the building remain plain. Prisons acquire the character of gloom by their small grated windows, heightened by the heavy doors and by architectural elements of all kinds pertaining to fortifications. Hospitals and asylums should have a more inviting appearance in the parts seen by convalescents, even if simple, to make them more cheerful. Ornamental grounds, sunny porticos, beautiful views and whatever else that can rejoice the heart, will be beneficial and suitable in this respect.

18. Military buildings, barracks, headquarters, arsenals, Guard rooms.

The buildings of group ϵ are buildings of heavy appearance corresponding to their purposes, to which the solidity of their rusticated masonry and the Tuscan order are peculiarly suited, and require to be characterized by all having reference to war; simple forms as bold as possible, massive construction, decoration by tapestries, equestrian statues, battlements and many other expedients, peculiarly adapted to them.

Barracks produce a certain uniformity by their extent, that perfectly corresponds to military affairs, with a contrast by angle towers, massively treated portals and the facade.

Headquarter buildings contain offices and the dwellings of servants, therefore approximating the structures classed under β , but require the character of buildings intended for war purposes. Arsenals are principally magazines for arms, also in many cases contain museums of arms, and they are sometimes

connected with manufactories of arms, cannon foundries, experiment stations, these being related to group n. In external design a large number of different buildings are arranged about an axis, whose centre is occupied by the museum of arms. Battlemented towers will serve as appropriate decorations for such arsenal buildings.

19. Railway stations, market halls, conservatories, buildings for industrial exhibitions.

Railway stations of higher rank always require large covered halls with which all other rooms are connected, or around which these are arranged. The waiting rooms are connected with large vestibules or porticos. Therefore the station is usually a central building with porticos and side wings, containing offices and the dwellings of servants. The front hall is parallel to the facade of a through station and perpendicular to those of terminal stations. Iron corresponds well to their nature and becomes a dominant element of designs for railway stations. Consequently these become structures of considerable extent, and their vestibules, wings, with perhaps a clock tower, give them a peculiar stamp. They are almost without exception resolutely built throughout.

Market halls, plant houses and buildings for industrial exhibitions are in great part structures of iron covered with glass with some portions in masonry. Their external appearance by the materials employed becomes very distinct and characteristic.

20. Manufactories, mints, bronze foundries, abattoirs.

All buildings in this class are usually massive, being chiefly intended for utility. The uses of factories forbid a richer treatment as already stated, for the money should preferably be expended to benefit the workmen, than for decorating the building. Yet it is worth trying to obtain the most pleasing appearance with a moderate expenditure.

Mints are royal or state buildings and deserve a certain distinction, even if modest treatment is seldom exceeded.

For abattoirs, the decoration is generally limited to the entrance gates and the houses of the watchmen. Their purpose is well represented symbolically by heads of animals.

21. Baths, observatories, aquariums, zoological gardens.

Bath houses require large vestibules and waiting rooms. They

sometimes have conversation rooms, drinking rooms, covered promenades, restaurants, and all the appurtenances required for life at the baths. Adjoining them are bazaars, music pavilions, all kinds of buildings for temporary occupancy, parks, places for games, etc.

Observatories are generally structures like towers with several basement rooms and having domed roofs for protection of the optical instruments. They may be decorated by all symbols relating to the heavens and astronomical research, with statues and portraits of famous astronomers, etc.

Zoological gardens may contain different kinds of structures. The entrance gateway with the porters' lodge are to be decorated to indicate the purpose of the garden. Restaurant for the public is an invitingly treated design with porticos for summer and enclosed rooms for winter, therefore furnished with heat. stables for the animals usually have separate rooms for summer and winter, therefore being partly heated. They should have special forms suited to the native haunts and mode of life of the animals, and they afford the architect an opportunity to design peculiar and pleasing motives. Sometimes are cabinets of collections in natural history and in ethnology in these gardens, which are to be treated accordingly.

1. PLANS OF CITIES.

a. General.

After treating buildings in detail and then in general, as well as in relation to their respective kinds, we still have a series of topics for consideration relating to the objects that serve to beautify a city, and which are included under the title of Plans of cities. If we examine the plan of any city, the first elements noticed are the streets, squares and gardens, by the intersection and parallelism of them it is produced. The blocks of houses, whose forms depend on the angle of intersection of streets, fill the interspaces between these elements.

Plans of cities have been developed in historic times in accord with local needs; they have grown naturally, and have developed according to already existing or newly created means of transportation. On the plan of the city has been formed on a fixed system, at the order of a ruler, or for the settlement of a colony, and all future additions to the plan must accord

With the system, as for example in Carlsruhe, Mannheim or Chicago.

The motives that determined the plans of cities were the following:- a, the castle of a prince or a cathedral formed the centre of the city; b, such a centre is wanting or consists of the intersection of two principal streets, generally at right angles; c, the city is only arranged according to the chief lines of transportation; d, the plan is developed according to given conditions of the site, which perhaps prevent its extension in one direction.

From these result certain types of plans, which are complicated by the existence of several of these conditions. The fortifications of cities in ancient times, in the middle ages and until the recent period, essentially influenced the form of the plan. The principal types of plans of cities are therefore the following:- a, centrally arranged plans; b, cross shaped plans; c, elongated plans arranged along a principal street connecting two neighboring places; d, sack plans, mostly placed in a valley surrounded by mountains; e, semicircular plans on rivers or next a mountain, lake or other obstacle, that only permits extension in three directions. Examples of central plans are found in great cities like Vienna, Berlin, London, Paris. Yet even in these cities a strictly central arrangement does not exist, from the operation of distinct conditions, and the general expansion of these cities has been modified by subordinate conditions. Thus Vienna with the cathedral of S. Stephen as a centre, was originally a semicircular centre with the Leopoldstadt beyond the Danube canal. Only after the different suburban cities had formed a ring was a truly circular plan produced. Paris and Berlin had ancient cities as a nucleus, located on islands around which the cities expanded. In Berlin the connection with Charlottenberg has become a principal line continued at an angle with the König street. The centre of Paris is occupied by the cathedral; of Berlin by the old palace, and the town hall form two centres on two islands of the Spree.

All Wendish cities are arranged on cross plans. This was also a favorite with the Romans. These cities naturally have four city gates. Among modern cities, Mannheim is one of this kind.

We find examples of long plans in Augsburg and in Freiburg in Baden. Long plans are developed from former market towns, whose wide principal streets are likewise market places, for

example at Tölz in upper Bavaria and in the city of Steyr in upper Austria, located at the intersection of two mountain valleys. In the last place are two suburbs named after the rivers, while the principal city occupies a peninsula between the rivers, which intersect at an acute angle.

A characteristic example of the sack plan exists in Stuttgart, developed in horseshoe form about its principal streets and hemmed in on three sides by the mountains and on the fourth by the gardens of the castle, so that it can freely extend only along the valley of the Neckar and around the castle gardens.

Semicircular plans are produced in various ways, for example Mentz, Cologne, Kampen, Munich, Linz and others. The general type of these is that in which A is the old and E the modern city, Fig. 403, as at Cologne, Mentz, Kampen, Frague, and many other cities of medium size. If the cities become too large, the old and new cities form a whole as at Vienna, Frague, Dresden, Florence, Rome, etc.

Two principal lines of transportation, one being parallel to the river, intersect both city and its suburbs. If a tributary enters the main river at right angles as at Coblenz, Passau, Amsterdam, two suburbs E and E' are usually formed outside the old city, or the plan of the city is grouped in zones or ring streets like that of Amsterdam, which are intersected by streets radiating from a central point, called the cathedral place in Amsterdam. To the last group of plans belongs the fan-like one of Carlsruhe due to princely caprice. The founder of the city of Carlsruhe intended the net of radial streets from the chateau should form a complete circle and surround the castle garden, but his successors thought otherwise, and so the city has only extended on the west, south and east, the garden, forest and park forming its northern boundary. In like manner the ocean or an inland lake forms a natural obstacle to the development of cities located thereon. For example Naples is arranged on its beautiful gulf in semicircular form with radial and connecting streets.

All cities that cannot be placed in one of the given classes and having irregular plans were produced by a combination of the given conditions:- thus Genoa is hemmed in on one side by the sea, on the other by a circle of mountains; it therefore

has a principal street encircling the harbor and many ascending hilly streets. Rome was also more or less influenced by its seven hills; cities like Perugia, Bergamo and others have an elevated upper city and a low-lying lower city; Siena, Zurich, Stuttgart, Baden-baden, etc., extend up the surrounding hills. Special obstacles also hinder the expansion of a city in various directions, as the Bois de Boulogne in Paris, the Thiergarten in Berlin, at Freiberg in Baden and similarly situated cities, the mountain at whose foot they originated.

It is only necessary to examine a volume of Baedeker's guides to recognize that the nucleus of most old German cities consists of a purposeless confusion of alleys hardly belonging to any type of plan mentioned; this is very simply explained, if we remember that the inhabitants necessarily built the fortifications as compactly as possible, and the streets or alleys were arranged to satisfy the most pressing needs. Much larger building sites were possessed by churches and monasteries, which determined the plan of communications. Convenience required rectangular blocks of houses in arranging plans of towns and usually governed the division of plans of cities. Only after the removal of fortifications, when the city could expand beyond its old boundaries, was the central plan developed in most cases, and a ring street took the place of the fortifications, which were changed into agreeable promenades in many German cities, even forming the principal street in Vienna, on which are located most public buildings and finest private houses.

The entire esthetic character of the city essentially depends of its form of plan, whether rectangular or triangular blocks were adopted. Rectangular blocks are most convenient for buildings, since they only produce houses with rectangular plans; still if the system is consistently developed, the city assumes a monotonous and dreary character. Triangles with too acute angles should be avoided, since acute-angled corner houses seldom make a good plan possible.

Cities arranged on the rectangular system like Mannheim and Turin, or parts of cities arranged in the same way like the quarter around the Gens d'Armes market in Berlin have the disadvantage, that much time is lost, if one desires to go from a to d in Fig. 405, since he must travel the distance $ac + cd$, it being immaterial whether the dotted line is followed or any

other possible course along the streets if pursued to reach the point d. In case of a fan-like plan like that of Carlsruhe, acute and obtuse angles of different degrees are produced. The same will result from the expansion of cities carried out by plans if rationally executed. Let A, E, C, D, F in Fig. 406 be five neighboring places, which it is desired to connect with a city as a nucleus. It will then be best to arrange five principal lines of communication to the different places, connecting these principal streets by ring streets. If it is desired to avoid acute angles, the vertices may be truncated and public squares be arranged at the intersections of radial and cross streets, so that this again recurs to the block system. F. Haumeister in his work on Extensions of cities, exhaustively discusses this and other questions, which do not require our consideration, except as they influence the esthetic appearance of a city.

The external appearance of streets and squares, the character which should be given them by the architect, depends on both the entire plan and on the character of that quarter of the city intersected by the streets. On the whole, one may distinguish three principal kinds of the parts of cities:- 1, business quarters, 2, residence quarters; 3, industrial quarters. Haumeister has very clearly stated on p. 80 of his work the conditions under which the character of the streets result from these. We shall briefly consider them.

The business quarter preferably occupies the nucleus of the city and extends toward the parts, where the seat of the administration and the city government, as well as the most important public institutions are to be found. Thence results the principal ground law, that contiguous principal streets are best adapted for shops and business offices, more quiet side streets being for residence and intellectual work.

The external portions of the city will always be best suited to the better residences if the means of communication are properly cared for, since the cheaper sites and the pleasure of a rural life lead to this end. The western side will preferably be occupied by the villa quarter on account of the prevailing western winds, affording the purest air.

Manufacturing and wholesale trade is preferably located with reference to natural and artificial transportation. Harbors,

canals and rivers determine the centre of the location of the wholesale business, the smaller value of the land in the outer portions of the city as well as the need of more space and the nearness of the great lines of communication, compel the location of the manufacturing quarter on the outskirts of the city. Only minor industries, mostly connected with shops, as well as the retail trade in general, are scattered over the entire city.

b. Streets.

Therefore the streets of a city will generally follow certain types with which their characters generally agree. They are principal streets, main lines of communication, or side streets, connecting the former or dividing a part of the city into blocks of houses, and finally narrow alleys. They are further villa streets, palace streets, streets of communication, and the streets for the poor. The principal streets are also main lines of communication, and building sites are dearer on them than on the side streets; hence to make the best use of the ground, this requires the buildings to be 4 or 5 stories in height. The ground floor is chiefly occupied by the better warehouses.

According to local conditions, these principal streets have two or four rows of trees. On account of the noise of carriages and in the street, these principal streets are not preferred by the best society. The houses are chiefly for rental, and their owners try to attract wealthy tenants by richly decorated facades. Therefore in order to make the best use of the capital, it is proper to arrange a mezzanine story, above this being placed the best story containing only a single residence, then next above are two flats in each story. The owner of the house can himself occupy either the mezzanine or one of the upper flats. In this way originates the type of the richly decorated palatial houses for rent, like those on the Ring street in Vienna, on the Linden, Potsdamer and other streets in Berlin. The prevailing character of the better class of houses for rental in Berlin consists in the use of bay windows with balconies, certain types of which are most common. In the simplest examples the bay window commences above the ground story and ends as a balcony below the upper story. This motive is more richly developed by verandahs at the sides, so that the bay window usually extends into the basement story, forming a small entrance hall. In double houses, that are favorites in Berlin,

each house has its bay window, and both are connected in the best story by balconies, or even in several stories. Bays that commence in the basement stories can evidently only be arranged where the house is back from the street line.

It is seldom that palace streets are found consisting only of palaces of princes and nobles, also of public buildings. A part of the Ring street in Vienna and also of the Linden in Berlin may be mentioned here. These differ from other streets in that the basement story exclusively contains living rooms as well as the offices of the manager of the building. The Heerengracht in Amsterdam, a part of Via Balbi and Via Nuova in Genoa, may properly be called palace streets, like many streets in Paris and other large cities.

Villa streets are found in most plans for extension of cities, are chiefly characterized by the usual occupancy of the villas by a single family only, and it therefore contains only a basement and a first story, also it is detached and surrounded by a garden. Therefore while the previously mentioned principal streets are bordered by higher buildings for rental, the villa streets are mostly low, quiet and inviting, little affected by noise in the streets, and more frequented by persons walking for recreation. The gardens in front of the villas are often so deep, that the villas can only be seen from the garden gates, and the entire street has the appearance of a street in a park. Garden porticos, trellised porches, pleasing garden fences or low garden walls and their entrances, etc., give the villa streets a peculiar stamp. These types of streets are seldom carried out in purity, but are mixed more or less, thus in many cities, there is a small garden before each house in a street, even if they are built in blocks; and in other streets, palaces and houses for rental alternate with shops, hotels and public buildings, as in the western portion of the Linden street in Berlin, in the western part of Leipziger street there, and in Maximilian street in Munich. The eastern part of Ludwig street in Munich is almost entirely occupied by public buildings, etc. But where circumstances develop naturally, a typical character of the streets will always be an aim for their inhabitants. The wealthy will always prefer to occupy their own houses with only their own families, and thus prefer the villa to the rented dwelling, which will be left to persons possessing

less wealth, such as military officers, officials and other persons, whose occupation makes removal to another city possible. Many cities have quarters preferred by persons pursuing certain occupations; thus men speak of a professors' quarter, a quarter for frivv councillors, an artists' quarter, etc. In other cities as in Paris, London, Amsterdam, Hamburg, Danzig, etc., it is indeed a very common or an exclusive custom for each man to occupy his own house, whose small size is the reason for the arrangement of living rooms in several stories.

Side streets and alleys will be more or less occupied by citizens of modest station, so that architectural decoration of the houses will be omitted, and they will only contain business locations of lower rank, which chiefly satisfy the needs of the daily life of the inhabitants. These streets descend by degrees to the streets inhabited by the poor, and only occupied by the lower class. In recent times it has been rightly attempted to better these dreary quarters by attractive dwellings for workmen. There are streets for communication, only containing business places with few dwellings which consequently assume a uniform character with a moderate architectural treatment, although the number of persons passing along them may be very great, as in portions of the boulevards of Paris. Allied to these are the canal streets like those of English and Dutch cities, and of Hamburg, almost entirely occupied by warehouses. Usually a navigable canal lies between two streets or close to a single street, as in most Dutch cities, less frequently extends along the rear of the houses, which facilitates unloading goods and their removal into the warehouse. In Amsterdam the character of these canal streets is elevated by intermediate steps from an absolute lack of decoration to palace streets, the Heerengracht being almost entirely occupied by the aristocracy of wealth.

Most goods will be transported by canals when bulk and cheapness are considered more than speed, like raw materials and bulky manufactures: reloading must be avoided as much as possible. Utrecht is most favorably situated, as most of its canal streets have canals at such a low level, that cellars are arranged under the pavements of the streets, through which goods are carried into the buildings over a quay. The quays are planted with trees, whose foliage commences at about the

level of the pavement. The streets then have the section shown in Fig. 407, which gives a very peculiar arrangement to Utrecht.

Venice is often improperly compared to Amsterdam, but the canals do not form lines of transportation for goods, but for persons, since the principal facades of palaces and houses lie on the canals, their rear being toward the streets. The general appearance of the Grand canal rises to that of a palace canal in many places; all alleys in Venice are narrow, so that no carriages of any kind are used there. Venice and Amsterdam therefore form the most peculiar contrast. The principal points to be considered from an esthetic point in enlarging the plan of a city, Faunstein comprises in these laws; symmetry of groups of buildings, picturesque perspective of streets and squares, well chosen points of view, attractive arrangement of the masses of buildings.

c: Squares:

These are intended to afford space for crowds of men in those parts of the city where travel is very great at certain hours. They have the further advantage of aiding a good circulation of air, and are the natural ventilators of cities. They also pleasantly interrupt the monotony of the connected streets, and add much to the picturesque character of a city. In earlier cities, hemmed in by fortifications, squares were frequently obtained after the removal of the fortifications by tearing down churches and monasteries.

Localities in cities where travel is exceptionally great at times are:- 1, intersections of streets; 2, at particular buildings. Since the square is not a luxury but a necessity in a city, it must be adapted to an increase of travel; squares too large cause heat and dust and may embarrass travel.

1. Squares near churches. On account of filling and emptying a church at the beginning and end of divine service, as well as for processions in case of Catholic churches, cathedrals and churches usually need squares of considerable extent. The square is usually located at the western end of the church, so that the principal facade forms the terminal axis of the square. In other cases the square also extends along the south side (Fig. 408 a), as at Regensburg and Strasbourg cathedrals. In yet others it also extends along the sides, leaving but an alley behind the choir (Fig. 408 b), as at Freiberg, or the church is

entirely isolated.

Older fortified cities were frequently compelled to surround the church on three sides with houses or it was built up on all sides, which influenced the plan (Fig. 408, c,d). Or the proximity of an existing cathedral allowed the architect to give an isolated church an abnormal form, like the Liebfrauen churches of Treves and Mentz. The location of a church on a hill generally affected the arrangement of its square. The largest and finest church square is that before S. Peter at Rome.

2. Castle squares. Most princely castles required a castle square for military reviews. Hence the castle square is in most cases the richest and most stately in its decoration, of all in the city, and more so if other royal buildings, theatres, museums and libraries are located around it.

3. Squares before town halls are frequently used as markets on certain days. Town halls represent the people and therefore usually placed near squares of large size, where citizens could assemble on special occasions. State buildings for officials, barracks, higher educational institutions, post offices and prisons seldom require squares, though generally built near them to decorate the squares. Buildings for societies, police stations, fire engine houses, schools, laundries and baths, abattoirs, market halls, industrial halls, cemeteries, etc. generally require squares or should be adjacent to them.

Jaumeister gives in his work a series of the most important types of plans of squares, which may be briefly indicated.

1. Four streets meet with acute and obtuse angles (Fig. 409, 1,2,3). The vertices are truncated obtaining eight obtuse angled buildings are obtained as at 1. In No. 2 the pairs of corner buildings are similar with two rectangular ones, while in no. 3, adjusting the irregularity of intersection of two streets with a third at different angles, there are two rectangular and four with different angles. If the blocks of houses are arranged on the rectangular system, several different cases may occur. 2. Two opposite blocks of houses are shortened (4), or two streets intersect and angles are truncated (5), or lastly the square lies between the extensions of two streets (6).

Combinations of both arrangements when streets intersect at right, acute and obtuse angles, give the arrangement No. 7, as

well as 8 to 12 (Fig. 409). If several principal lines extend through it as in the last five examples, the square is peculiarly adapted for decoration by means of buildings, fountains, gardens, etc. An enlargement of a continuous street on one or both sides is admissible at those points where travel increases, according to sketches 13 and 14 (Fig. 409), as in Leipziger and Fariser streets in Berlin.

Monuments, fountains and gardens, porticos with seats, are the most beautiful decorations for squares, with lamp posts for lighting by gas and electricity. Gardens are peculiarly adapted for the decoration of squares; lawns, shrubbery and trees heighten the picturesque character of the squares and afford for the eye a beneficial change from the turmoil of the city. Still, these designs should not injure the appearance of the buildings, and their height and extent should be suitably limited. It is proper to conceal urinals by shrubbery.

Enclosed gardens or the so-called parks are not well adapted for open squares. They are sometimes so arranged as to form the central point of a group of buildings, which adjoin the street on but one side, but abut on the four inner sides of the park (Fig. 410). This produces inviting and quiet residences that may be very near the principal streets, though removed from their noise.

Monuments, fountains, ponds, seats, kiosks and beds of flowers serve to ornament such squares. To them which are sometimes called gardens, by which travel should never be obstructed, also belong larger squares covered by gardens or plantations of trees, like the Hofgarten in Munich, the Schloss Platz in Karlsruhe, Lustgarten in Berlin, Champs Elysees in Paris, etc. Smaller and more numerous squares are preferable to a few large ones in any city.

d. Gardens.

Many cities have large parks and palace gardens in their suburbs, like the Prater in Vienna, Thiergarten in Berlin, Bois de Boulogne in Paris, English Garden in Munich, Schloss Garden at Stuttgart, Karlsruhe, Darmstadt, etc.

When such gardens or parks exist naturally or even artificially, they should be cared for and beautified as much as possible. They are the principal places of recreation for the city,

sometimes containing pretty bodies of water, ponds and streams, and they are much visited on certain days in summer on account of military music, and their borders are favorite places for restaurants and places of amusement. Many cities must be satisfied with promenades, arranged on the site of the ancient fortifications, for the lack of such gardens; this is the case in most cities in Holland, of which only Amsterdam, Haarlem and Hague have their noble parks. Ancient cemeteries no longer used for burials are sometimes transformed into parks. Places for games should be arranged in cities as well as botanical and zoological gardens, baths, places of amusement with palm gardens on the model of the palm garden at Frankfort, Flora at Cologne, and that of Charlottenburg. One should further never neglect to arrange seats in gardens and squares, as well as porticos, where opportunity offers, that persons may shelter in case of rain and may promenade. Only monuments should not have seats near them, because these only afford too ready opportunity for defacing the monument.

U. WELLS AND FOUNTAINS.

Except monuments, the most beautiful and suitable decorations of squares are wells and fountains. Markets require cleanliness and therefore fountains, which are now merely hydrants with large tanks, their centres occupied by a pedestal supporting a large shell, a canopy or a statue or group of statues, or a structure like a tower like the Schöne Brunnen at Nuremberg. The market fountain is a running fountain. There are several other types of wells or fountains:- 1, the well, well house, enclosed spring. 2, the running fountain; 3, spring wells and fountains; 4, cascades and water decorations.

1. Cistern wells are vertical and usually round shafts sunk to the water level, sometimes to a depth of several hundred feet. Furnished with a curb at top with some arrangement for raising the water, merely a bucket and chain for wells of small depth. The well curb must be formed so that the full bucket may be set on it, and its exterior may be ornamented by reliefs. The finest examples of such curbs are the bronze curbs in the court of the Doge's palace in Venice, that are circular internally and octagonal externally.

The shaft of the well itself is even treated esthetically in

some cases, sometimes as a winding stairs with open well in the lower part of it being a basin for collecting the water. Such a well belonging to the mediaeval period and of square section is the so-called Jew's bath in Friedberg in Taunus, and we have an example from the Renaissance period in the well of Antonio Sangallo the Younger at Orvieta, begun after 1525. The latter is of circular section.

In most cases the bucket is suspended by a chain that runs over a pulley. The pulley itself must be supported in any suitable manner, and a series of motives are thus produced which have been executed in many places. Sauvageot gives a beautiful well with two buckets, one supplying the garden of a monastery, the other a street at a lower level. (Fig. 411). Two piers of different heights support a horizontal stone beam strengthened by decorative additions at the middle, to which the pulley is fastened. Over the piers free terminals are added as decorations of the stone beam. Wells of this kind are not infrequent in the cloisters of Italian monasteries. They are usually placed at the centre and are elevated on several steps. But they may also be attached to a wall into which the end of the beam is built, the other end being supported by a column (Fig. 412). This motive may be turned to good account by making the beam quite long, arranging that one can pass around the well (Fig. 413). It will then be advisable to place a corbel between the beam and its supporting pillar, which may be formed in various ways. If the well is distant from the wall, the stone beam may be replaced by an iron beam, then let into the block that supports the pulley. A very graceful late Gothic well of this kind stands in the court of the Gymnasium behind the choir of the cathedral in Strassburg.

A further development of the well is produced by placing a strong covering slab above three or more piers supporting the pulley. The centre of the covering slab may be strengthened, which originates the motive of distinguishing this centre by decorative additions, as well as ornaments placed above the piers, statues and ornaments; the German Renaissance has left many such wells, the motive being improved by wrought iron work. This motive of the canopy well is developed in larger designs of similar character in a small polygonal structure. (Fig. 414).

An example, though more simple than the one shown, is found near the church in Veere in Holland, where the rainwater is collected on the roof of the church, led in a channel E that runs around the cistern, the impurities being deposited in it, while the clarified water flows into the collecting basin by openings filled with bricks set near each other; thus only the water can pass through the slits as shown in Fig. 415. The channel E and tank A may be accessible by steps. The pulley for the bucket chain is supported from the keystone of the vault. In very deep wells the weight of the chain and the buckets is too great for the chain to be simply drawn up by hand; in such cases as in derricks, a windlass is substituted for the pulley, to which the chain is fastened, and this is supported by two bearings. A wheel is attached to the axle, which is then turned by both hands, while the chain is wound on the axle. A ratchet prevents the wheel from slipping out of the hands. Then the raising of water by machinery requires protection by a roof, so that iron parts may be as little as possible exposed to rust. The whole design of the cistern is then detached and covered by a building, or is placed in a niche of the wall and covered by a protecting roof.

Well houses are usually employed where a spring is treated like a well and is placed under a roof. The spring is then enclosed to serve for drinking, so that the surplus water is removed. Mineral springs in particular require attention to be devoted to both these points. In cities like Eaden-Eaden, where naturally hot water is obtained in such quantities as to be used for economical purposes as well as for drinking and baths, public fountains are usually arranged as niches in the walls, and the outlets for water are closed by stopcocks. Special drinking halls are generally planned where the water is drunk.

Other designs for fountains are arranged like small open buildings, where the water runs from one basin into another lower one, then into a third, etc., so as to remove all vestiges of impurity. Such fountains are vaulted with open rooms at one side, belong to the mediaeval period, and still exist in several Italian cities, as in Siena. A few similar spring houses also remain in Germany and France.

Larger designs for springs also consist of an open basin with

a channel for removing surplus water, and one descends to the basin from the higher ground level in a flight of steps. A fine example of such a design is afforded by Donaueschingen in its so-called source of the Danube.

Between the cistern wells and flowing fountains are pump wells, which are seldom public wells but are found in courts of private houses, and are therefore seldom decorated. The cistern is then covered by a stone slab at whose centre stands the pump, usually of wood with a swing handle. It is also made of stone or cast iron, and is then treated like a stone pillar with cap and free terminal ornament, or a cast iron column with any form of capital supporting a statue, lamp, or free ornament. The handle of the pump may have a decoration at its upper end by iron bands like volutes to avoid its swinging sidewise. Below the spout, often treated like a rain spout, as the head of a lion, dolphin or dragon, etc., stands the basin, most simply a hollowed stone slab, but in more pleasing designs being like a vase resting on the base of the pump and crossed by orn rods at top, on which the water pail is placed, (Fig. 4#6).

2. Running fountains principally differ from cistern wells in being supplied by water aqueducts or springs led through pipes from a reservoir higher than the outlet. According to their arrangement, they are either wall fountains or detached fountains. The former are often placed in courts, are niche fountains in the front of the basin and project little from the face of the wall (Fig. 417). An architrave like that of a door decorates the niche, and this may be developed into a canopy with pilasters, columns, pediments, etc., while the front of the basin has space for any decoration in relief. In circular niches, the upper part is ornamented like a shell, a horizontal band being carried around at the height of the springing, and in case of richer treatment the discharge pipe may be connected with a statue in any way. The fountains in the courts of Italian palaces as well as the sacristies of churches are mostly formed in accordance with the same principles, the basin is composed of or covered with marble slabs, and is sometimes of cast bronze. Another arrangement of wall fountains is to place the basin before the wall face, so that the niche is shallow; this arrangement would be quite suitable for the corner

of two streets meeting at an acute angle (Fig. 418).

A third arrangement is particularly adapted to be placed under the landings of ramps or stairs for terraces, aquariums or fishponds, lighted from above, is to arrange a well house, which is to be regarded as an enlarged niche. These three modes of arrangement may usually be varied in many ways, and treated according to the principle of decoration of niche fountains, may be developed into grottos of all kinds like those in so many Italian gardens, as well as in water decorations of the late Renaissance. Imitations of stalactites, tufa, glittering minerals, shells, figures spouting water, dolphins and dragons, silenuses, serve to ornament such grottos, which were also favorites at courts of French and German princes. Such grottos exist at Versailles, Sanssouci, Schwetzingen, Wilhelms-höhe near Cassel with its water ornaments, as well as elsewhere.

The simplest form of detached fountains may be treated like pump wells. In richer designs the number of water basins and discharge openings would be increased, and a corresponding form of plan be selected (Fig. 420). The most varied forms are especially possible in the larger market fountains, whether the basins are set in tiers above each other, or a common basin is formed. The upper basin may also be accessible by steps. (Fig. 421)

Evidently the varied simple and combined polygonal forms (Fig. 422) may be used to good advantage as the systems of plans of such market fountains, and may vary according to whether they are connected with stairs, seats, or gas lamp posts, or an upper group of water shells is formed besides the common tank.

As a means of decoration of these and other designs of fountains, all animal, plant or purely ornamental forms are suitable, if they have reference to the water. The front side of the basin may have reliefs of all kinds; the central pillar of the fountain (Fig. 423) consists of a plain rectangular or circular or polygonal body a, mostly in the water, a second b contains the discharge pipes, and may be decorated by inscriptions, coats of arms, reliefs, etc. Above this is the base c with plan suited to that of the lower portion, and above is a cap that may bear a statue, a canopy or lamp post d. The upper basins may be formed as vessels or shells; care must be taken that they do not appear too massive if seen from below. It is a favorite idea for market fountains to add water-spouting

statues in suitable places, even on the margin of the basin, to enclose the entire fountain by an iron grille, so arranging it that in spite of the grille, a pail may be filled. For this purpose parts of the basin may be corbelled out or openings are formed in the grille at proper places.

3. Spring fountains and fountains. For these the same is more or less true that has been said concerning running fountains, but with this difference that they perfectly serve a purely decorative purpose, and are only employed in gardens, as a means of obtaining water, being connected with basins for gold fish or water plants. The simplest form of spring fountain consists of a shell on a pedestal; richer forms have several shells over each other, the lower fed by the upper. The whole may be surrounded by a single basin. The shells may be replaced by groups of shells, and the pedestals may be in form of short columns, a clustered pier, the lower part of a vase, or figure sculptures. Discharge openings take the form of simple tubes, flowers, mouths of animals, or may be connected with statues. It is evident that the greatest latitude is possible in the treatment of fountains; thus a well known spring fountain in Rome has the form of a boat, and the one in Piazza Navona is crowned by an ancient obelisk. A rich contrast of falling and rising streams of water overflowing shell basins, shell like mouths as discharge openings, sometimes make real water ornaments of spring fountains. They may also consist of an islet in a basin treated and ornamented by statues supporting the water shells; it may further be enclosed by a canopy structure or it may decorate and cool the interior of a room.

4. Cascade fountains are purely ornamental in purpose and are architectural works with considerable volumes of falling water. They may be merely architectural like Aqua Paola in Rome, with three great streams of water pouring down from a gate-like structure before a triumphal arch, and flowing into a collecting basin. Or in front of an architectural background, is constructed natural or artificial rock work, from different parts of which water gushes into a great basin as on Fontana Trevi at Rome. Such cascade fountains may be developed into extended water ornaments by sculptures and plant ornaments in connection with buildings, flights of steps, bridges, grottos,

etc., as at Sanssouci and at Wilhelmshöhe in imitation of those at Versailles.

The wall enclosing the basin may be formed like a seat (Fig. 424), whose back must have sufficient height, that a child standing on the seat cannot fall into the water; for this purpose the coping may be crowned by a low iron railing to prevent one from climbing over the enclosure of the basin.

V. MONUMENTS.

Besides fountains the principal decorations of streets and squares are monuments, for which we have only to consider memorial and not sepulchral monuments. In all cases a distinction is made between the object to be supported above the ground, the pedestal, and the base or foundation.

According to the object supported by the pedestal, we may classify eight different kinds of isolated monuments.

1. The object consists of emblem: a cross or an obelisk, a tower structure (monument on Kreuzberg, Berlin).

2. A bust is supported.

3. A statue is supported.

4. Two statues are supported.

5. An equestrian statue is the object.

6. The principal figure stands on a pedestal surrounded by 4 or 8 subordinate statues.

7. The monument has an architectural background.

8. It is purely esthetic, decoration by statues subordinate.

There are two primary requirements for monuments of all kinds; they must have good proportions of masses, and if isolated, their outlines must be pleasing. Unfortunately both requirements are seldom satisfied, since the training of the sculptor is too slightly architectural, and he takes advice from the architect only when the idea of the composition has been already decided. Thus for example, the Luther monument in Worms is faulty in arrangement; the subordinate figures stand on the enclosing wall and give the whole the appearance of a chessboard, on which stand several figures. It should be a first condition of an arrangement on the plan (Fig. 425), that the statues at a should in some way be connected with the monument proper at b.

In the Luther monument in Worms all the statues like that of Luther himself are looking in the same direction toward the east, which has an unpleasing effect, the monument is also not

orientated at right angles to the axis of the street, but is parallel to it, extending from east to west, which must be considered a mistake, when the monument is not placed in the middle of the street itself like that of Frederic the Great in Berlin, but stands at the side of the street.

The Schiller monument in Berlin must be regarded as being quite faulty, both in proportions and in its dimensions relative to those of the square in which it stands, since the structural masses of the theatre or of the two churches on Gend'Armes market required a bold and massive structure. The monuments in Berlin most pleasing in proportions are Schinkel's monument of the great elector and Rauch's monument of Frederic the Great.

In regard to proportions and effect of outlines, these will always be decided by the proportions between the pedestal and the object supported by it, and which prescribes its plan. If we conceive that a cube rests on a slab and supports a pyramid, (Fig. 426), the proportions of the masses viewed diagonally will be completely changed and may be unpleasing; had we drawn a cylinder with height equal to its diameter and supporting a cone, instead of the cube and pyramid, its appearance would be the same from any point. If we employ a form intermediate between the two, we have two choices of a form for the monument, either the octagon or the cross (Fig. 427). Circular, octagonal or cross pedestals always look best if viewed diagonally. It is preferable to make the pedestal of such form as to produce a gradual transition from the square to the cross, then to the octagon and finally to the circle. If we again return to the simplest case and insert a cap between the cube and the pyramid (Fig. 428), its projection will conceal a part of the pyramid and thus lessen the object supported by the pedestal. As it is really the principal part of the monument, the pyramid should appear as large as possible, hence a special base is properly given to it, whose mass is in a pleasing proportion to the mass of the pyramid. If the base is too massive, the pyramid looks small, and if too low, it does not act as a mass. If an obelisk is made the principal object of the monument (Fig. 429), or a memorial column instead of a pyramid, the mass of the base would appear unpleasing in proportion to the obelisk.

On this consideration are based the good and bad arrangements

of monuments. On most monuments the proportion between object and pedestal is therefore displeasing, since the pedestal is made too high, producing too massive an effect. It too frequently looks like a tile stove. Therefore it will always be proper to insert a special base between the cap of the pedestal and the principal object of the monument, thus reducing the total height of the monument by a substructure in parts. One will never fail if these ground laws are obeyed, as Rauch did in his monument of Frederic the Great.

A second point requires notice, that the pedestal and the base of the object must be so arranged with reference to the object, the treatment and the decorations in relief, that the object becomes the principal thing, or that a contrast is produced between the treatment of the object and the more or less detailed treatment of the base portion.

Thus an equestrian statue agrees with a richly treated base above a more simply formed pedestal, statues with rich drapery or richly detailed costumes, a standing or crouching lion, a dragon fight, etc., will require plain and simple bases and pedestals, to retain the contrast. Thus the development of the architectural mouldings of the base and pedestal essentially depends on the degree of detail in the principal object.

To treat a monument as a sham fountain from which no water flows like the Schiller monument in Berlin, is a coarse offence against the external and internal truth of an art work.

The ascending steps that form the substructure of a monument should recall the steps of stairs as little as possible, and therefore should be so profiled that rain water may speedily run off, and that their purpose may be apparent to the eye. (Fig. 430). Inscriptions are best cut with a rectangular section of the letters; incisions with triangular section easily become illegible by exposure to weather. To arrange seats on the monument itself is improper, since it may easily be defaced. But it is suitable to place seats in the vicinity of the monument so that it may be seen with ease.

1. In monuments whose principal subject consists of emblems or objects of any kind, except statues, the base and pedestal should be arranged to accord therewith. A fine motive of such monuments is shown in the obelisk fountain in Karlsruhe (Fig.

431); an obelisk is flanked by two griffins, lions, river gods, etc., whose massive oblong pedestals project beyond the square of the obelisk; the latter is utilized as a running fountain, whose two basins may project beyond the pedestal at its sides. The same motive may be utilized in monuments with statues.

2. Monuments with busts usually have a proportionally high pedestal that receives the inscription; to prevent this from having a too massive effect, a special base may be inserted between the cap of the pedestal and the bust. The busts may stand free or may be placed against the rear walls of porticos, or also be arranged as memorial fountains. The busts may be protected from rain by a canopy-like structure.

3. Especial care must be taken in case of detached monuments with statues, that they have good proportions on all sides, and that they diminish properly upward. Therefore it is proper to cover the figures with mantles, which conceal the spaces between the legs, to place emblems at the feet of the figures, pedestals supporting an arm of the figure, and similar accessories, which give the chief object a broad base. Hence in many cases, sitting figures appear better than if they were standing, since their lower portions are broader. In monuments with statues, the pedestals usually look too broad when viewed diagonally, and the angles are therefore usually truncated (Fig. 432). In more richly detailed pedestals, the angles are flanked by pilasters or slight projection, and an entablature is inserted between their capitals and the cap.

4. Monuments with two statues as a rule require an oblong pedestal, with its broader side at front. This broad front side then requires, so as not to seem empty, to be divided by reliefs, inscribed tablets, and like accessories. Figs. 433 and 434 represent the base of such a monument at Geneva, executed after designs of Professor Nicolai.

5. Equestrian statues likewise need an oblong pedestal, but its end is in front. The bold mass of the body of the horse forms an esthetic contrast to the pedestal, at whose base angle statues may be placed. Among the most beautiful equestrian statues are the monuments of the Great Elector, of Frederic the Great, that of Colleoni in Venice, the angles of the pedestal being decorated by columns.

6. One of the most extensively employed types of monuments

is that where a central statue is surrounded by four angle figures. An increased development in height results in such monuments as well as a pyramidal enlargement downward. It is preferable for these monuments also to make the pedestal lower, placing the principal statue on a special base (Fig. 435). Most seated angle statues likewise have separate bases.

Sometimes four subordinate statues are placed between the angle statues, or groups of emblems, coats of arms and other symbolical or ornamental accessories. These may be so arranged that the lower part of the pedestal is separated from the upper portion by a cap, and independently developed architecturally, so that the upper part becomes a low frieze, flat or decorated by reliefs. In this way the mass of the pedestal can be more richly treated, and its beauty of proportion be increased by these subdivisions.

7. The treatment and proportions of an architectural background of monuments must be arranged in accordance with the monument when serving as a foil to heighten the importance of the monument. Thus the statue of Bevaria in Munich is surrounded by a hall of fame, and in the competition for the monument of Victor Emanuel, a triumphal arch was placed in the foreground, beneath it being placed the actual monument. The architectural surroundings of a monument may evidently be arranged and treated in the most varied ways; not too large a scale will always be preferable for the architecture, so that the monument may be as prominent as possible. Michelangelo well understood in his tombs of the Medici as well as in the monument of Pope Julius II, how to make the statues themselves more imposing by the small scale of the architectural background.

There remains a word to say in regard to monuments, which are not detached or isolated. They are generally arranged as niche monuments attached to a wall, and the architecture of the niche forms the principal motive of their treatment. The motive of the triumphal arch was frequently used to good advantage in the more extended designs of this kind. Four niches, each containing a statue, are also combined in a detached monument, that terminates at top in some form of roof. (Fig. 436).

8. Purely esthetic monuments are usually arranged according to a few ground types as memorial columns, tower structures, temple buildings, and also as statues arranged around a centr-

central point. When the memorial pillar is of slender proportions, it may take the most varied forms (Igël column near Treves, monument of Columbus at Genoa, Memorial column in Neustadt at Vienna, Mary's columns of Rococo period in different cities of Austria); in larger designs it was usually treated as a column with capital, whose abacus is accessible by a winding stairs (column of Trajan in Rome, Column Vendôme in Paris, Monument of victory in Berlin). Monuments like towers are either solid (monument of Lysicrates, monument on Kreuzberg in Berlin), or are arranged to serve as towers for observation.

These may also be treated in different ways according to location. The substructure containing the entrance to the stairs or an elevator, (towers of Trocadero in Paris), sometimes forms an extended architectural design, sometimes with the form of an open portico, that of a chapel (Fig. 43, a), or finally a cross shaped substructure b, with centre occupied by stairs. In arrangement a the stairs may be placed in an apse, so that it is first connected with the central stairs above the vaults.

We have a characteristic example of temple and centrally arranged plans in the Walhalla near Regensburg and in the Ruhmeshalle near Kehlheim. Such designs with which are to be classed lookout pavilions, like the Gloriette of Schönbrunn near Vienna, do not admit of a general discussion, being entirely free compositions, probably the freest and most pleasant problems of the architect, permitting a multitude of solutions.

W. CITY GATES; TRIUMPHAL ARCHES.

Now that most cities have no narrow circle of fortifications, a principal motive for the treatment of city gates entirely disappears, that gave the gates a certain character in early towns, the gate tower that sometimes only served to contain a portcullis or drawbridge, or sometimes the prison, or guard.

City gates have become obstructions to traffic according to modern ideas, and one is disposed to remove them, rather than erect new structures. If they have been retained from consideration for esthetically important older gates, the old fortifications have usually been torn down at right and left of them, and the traffic near the gates is thus facilitated. If new gates are erected, the plan of the streets is generally arranged so that the larger central opening is used for wagon traffic, while the smaller side openings serve foot passengers. Yet such

modern gates eventually proved too narrow for the traffic, so that they were entirely isolated like the Propyleum at Munich, or passages later arranged at one or both sides as at the Brandenburg gate in Berlin.

Gates are frequently flanked by guard houses, or by buildings for collection of the octroi duty. Thus results the usual arrangement of three openings between wings. If the central gateway is covered by a semicircular arch as well as the narrower side openings, the motive of the triumphal arch is usually the most natural design. (Fig. 438). The middle part is generally crowned by an attic and group of statues, a quadriga or other symbolic decoration, and the wings are covered by platforms reached by stairs, and their parapets may have battlements. Such platforms are peculiarly suitable for seeing life in the streets during festivals, and open boxes may be arranged over the side arches for the same purpose. Where wings are unnecessary, external stairs may be placed to make the attic accessible. If streets terminate without a gateway, their ends are preferably marked by squares and by corner buildings of more importance. Gateways in the interior of a city usually result from the passage under a railway. In the better quarters they especially require artistic decoration, which should at least comprise a pleasing and bold limitation of the masonry forming the railway viaduct. The same is also true of railway tunnels inside cities. Thus the tunnel under the castle of Heidelberg should have been constructed at somewhat greater expense.

X. BRIDGES, RAFTS, FASINS FOR WATER, HARBORS.

Bridges over canals and rivers within cities are usually low, as the level of the streets is not much above the highest level of the water, as in Paris, Berlin and Amsterdam. In cities in mountainous regions, bridges are placed high above the point of view; reference is here made only to the chain bridge in Freiberg in Switzerland. It seldom suits wagon traffic to raise the bridgeway too much at its middle, so that in cities like Amsterdam the towpath must be lowered on account of the many bridges spanning canals, causing transport of freight on the canals to take other routes. If the bridge spans a stream so that its sides cannot be seen (Fig. 439), it is then erected as a structure purely utilitarian. But if streets extend along the banks or passenger steamers pass under the bridge as in

Paris, there is opportunity for an esthetic treatment of the sides of the bridge. Thus many city bridges, the Seine bridges in Paris, Arno bridges in Florence, Moldau bridge in Prague, Elector's bridge in Berlin and others, are treated and decorated as architectural works. The motive of the decoration of bridges of symmetrical form as stated in former Chapters, is furnished by the arrangement of abutments and piers; in large iron bridges any decoration desired is concentrated on the piers, while scarcely anything is added to ornament the bridge itself.

In the selection of the mode of construction lies a principal means of giving a pleasing appearance to iron bridges, and this should be carefully considered for large iron bridges in cities as far as circumstances permit, so that they not only satisfy material and also esthetic needs, and the monotonous lattice and ugly Pauli bridges should therefore be avoided. The bridge over the Rhine at Coblenz is one of the most pleasing iron bridges, and it springs over the stream in a single arch. Arched bridges are generally most pleasing when in a single arch like nearly all bridges over the Seine at Paris. It is only admissible to cover the construction with plates for smaller iron structures, and great bridges must produce a pleasing effect by the division of the masses.

The principal decorations of bridges always consist of an architectural treatment of the caps of the piers. The end portals and the caps of the intermediate piers, besides the structure itself, give the bridge a special stamp. The end portals are either towers, as at the bridges over the Rhine at Strasbourg and Mannheim, where double portals are constructed on account of the double tracks of the railway; the foot ways on each side lead to the arrangement of two large and two smaller entrance openings, or if the bridge is to serve for wagon traffic at the same time, to the use of three large and two small gateways. Or the end portals are flanked by towers, as in case of many bridges in fortified cities (Mayence, Coblenz and Dirschau bridges). Tower portals may receive the richest architectural treatment.

The most beautiful decoration of intermediate piers consists of bridge chapels, great favorites in the middle ages. Small structures for various purposes may be erected in their places.

a lookout tower may also be built on the central pier.

The chains of chain bridges require a special support at each bridge pier, that usually takes the form of a tower. The appearance of the chain bridge over the Danube in Budapest is very stately and dignified; the series of portals and the lines of the chains of the structure itself produce a pleasing effect.

On smaller bridges in cities a favorite idea is to substitute separate statues or groups for the end portals, to decorate the middle pier by a monument as on the Elector's bridge in Berlin, the old bridges of Frankfurt and Prague, and the posts of the railing are made posts for gas lamps. It is likewise very proper to widen the foot ways by corbelling out the tops of the piers, as in the bridge over the Rhine at Easle, where semicircular pier caps are furnished with seats.

The railings of stone bridges are preferably solid and also of stone, or perforated and made of brick in smaller bridges, or are balustrade railings, and are made of wood for wooden bridges or of iron for iron bridges. In the first case, the railings are parapet walls extending between pedestals, which may serve to support lamp posts for gas or electric lights; in smaller bridges the railings may be treated as lattice girders producing a structural effect. Railings of wooden bridges are usually constructed of an external covering of boards, like balustrades of galleries and may be made of fret-sawed boards. Completely covered wooden bridges were formerly favorites, covered stone bridges are rarer, like a bridge over the Arno at Florence, where a corridor passes over shops and connects the Uffizi and Pitti palaces.

All structural decoration is generally rejected in case of ramps, quay walls, retaining walls, etc.; rusticated masonry,, cyclopean masonry, and all bold and solid masonry are best suited for these. The middle ages and Renaissance were not always satisfied in such cases to consider merely the material needs; engineers were always too much artists, and artists were too much engineers, to be pleased with a bare wall without decoration. By corbelled bays, battlements, sculptured coats of arms, emblems of cities, reliefs and angle towers, and similar expedients they sought to relieve the monotony of their walls; if these were walls of fortifications, then the preceding expedients were added to the elements of military

architecture, making interesting esthetic decorative works of city walls, ends of bridges and city gates. The entire quay wall in Höchst on the Main is even decorated by a late Gothic round arched frieze ornamented by lilies.

Walls of large docks for receiving ships, as well as those of harbors, are usually flat and plain, which is best suited to their purpose; cranes and other machinery for loading, wood posts and iron rings for mooring vessels, landing stages and stairs, belong to such shore walls. Sheds for goods, custom houses, covered halls for sailors, light houses, waiting rooms for the public, ticket offices, restaurants, hotel gardens and similar accessories, give the shores and harbors their special stamp according to local conditions. One of the most beautiful harbors is that of Genoa with its great portico; one enjoys the magnificent view of the ships and the activity on shore.

Our modern insipid era has done little to make the treatment of harbors more pleasing; still something has been done of Lake Constance in this respect. The harbors of Constance, Lindau, Friedrichshafen, are known for their beautiful designs. Geneva also possesses beautiful quays, as well as parts of Naples, Trieste and Leghorn., in their quays decorated by gardens. Other cities famous for beautiful harbors and shore promenades are Dover, Havre, Brighton, Kiel, Hamburg and Portsmouth on the Isle of Wight. The very large quays in London and other sea ports serve exclusively for material needs, so that attention is paid only to architectural considerations, so far as to locate magnificent buildings in their vicinity, railway stations, hotels, warehouses, etc.; these large and really splendid structures give to such harbors and quays a specific esthetic character.

Y. LIGHTING OF CITIES.

This is preferably by gas and electricity, and requires lamp posts for supporting the lights. Since cities require a large number of lamps, cast iron is usually employed as the material of lamp posts; it is proper to make the pedestals of stone for large lamp posts, such as are usually erected before palaces and public buildings or on squares. It is even advisable to treat the pedestals as columns for sake of economy, and because they may also be used as posts for stopping carriages. In many places such columns are also used for supporting a clock, thermometer and barometer, a leaden plate being hinged

to their lower part, that it may be turned like the leaf of a book, and on it may be painted a plan of the locality, addresses, times for visiting things worth seeing, etc. The lower part of the lamp post is made wider and may be treated like the classic tripod, or the lower part of a vase. The shaft can be diminished upward and is also best treated in imitation of the antique candelabra and similarly decorated, usually crowned by a freely treated Corinthian capital, which supports the lamp or a circle of lamps, with angular or scroll arms radiating from the centre. The lamps may be placed in a circle or in several tiers above each other, forming groups of three, four or five. It is usually expected to obtain from such groups better effects than they actually produce, for a pyramidal group does not appear so well from beneath, as does the simple arrangement in a circle; still the size of the lamps will decide which arrangement should be preferred. When burners are used without glass shades, as in circular crowns of gas lights, the space required for each is less than if shades were used, which both protect the light from wind, modify and disperse it. Reflectors are often placed behind the lamps.

The lamp posts as works in cast iron admit of the most varied treatment in detail; zinc or bronze is rarely used for lamp posts except in enclosed rooms, and wrought iron is only for lanterns in private houses, since these metals are too costly to be used for the great number of lamp posts needed in a city. Cast zinc possesses too little strength unless the material is quite thick, to be exposed to injury in the open streets, that might deface the lamp post.

2. DECORATIONS FOR FESTIVALS.

These serve temporary purposes, therefore excluding everything monumental, employing expedients of very diverse kinds, according to the season of the year, in which they are erected, such as standards and flags, garlands of leaves and fir branches, wreaths of flowers, triumphal arches and gateways built with a wooden framework, over intersections of streets, tapestries, draperies, ornamental paintings, emblems and coats of arms, decorative objects of all kinds made of gypsum, paper and clay, tablets with inscriptions, illuminated transparencies, etc. For festivals and ceremonies when the court and government or city officials appear on a special square, and the spectators

concentrated, raised amphitheatres, pavilions for the court and officials, and music stands are necessary, while for musical festivals, for shooting contests or tournaments, large assembly halls, restaurants, offices and similar subordinate rooms for various purposes are needed.

For our era world's exhibitions take the place of Olympic games of the Greeks, and contests of animals and men in Roman amphitheatres. Almost all larger cities have their buildings for industrial exhibitions, wholly or partly devoted to local exhibitions, for musical contests, art exhibitions and other purposes. The world's exhibitions in addition to the halls of exhibitions require a multitude of annexes, restaurants and places of amusement, kiosks, and special designs of which as little may be said in a general way as of decorations for festivals. Local conditions, customs and usages, character of the festival and that of preparations for it, govern the decision for expedients to be used in the decoration. Thus the character of the festival and decorations will be decided by the mourning of a solemn funeral ceremony or by the joy of a festival.

Festivals of all kinds may be collected under certain general points of view. Church festivals have their peculiar character, determined according to the sect, and recur annually like Corpus Christi day in Catholic cities, or as in the next group they may be regarded as historical and are festivals of greeting at the installation of a recently elected pope or a newly appointed prince of the Church, or may be any jubilees.

Historical festivals are those connected with a prince, like those just mentioned, when the more important days, coronation, marriage, victorious return from war, birth and death, are commemorated. A third category includes all popular festivals of music, singing, shooting and gymnastic contests, that recur annually or periodically, like the October festival in Munich, First-meadow festival in Dresden, People's festival in Cannstadt. To these are allied the traveling collections attended by professionals during Pentecost, and finally the great exhibitions that terminate in late summer or autumn, according to their importance, or world's exhibitions, which usually last from May till the end of October.

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I
ARCHITECTURE

in its

Development from the Origin to the present Time

Introduction to the History, Technics and Styles

By

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Volume I

Antique and Mohammedan

With 253 Illustrations

Leipzig

1911

Translated by N. Clifford Ricker D. Arch.

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Urbana. Ill.

1912.

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PREFACE.

The suggestion to prepare this work came to me from numerous students as well as instructors in higher and middle polytechnic schools, and from the inquiries received by me from practising architects, artists and friends of art for a manual, that gives in the most comprehensive, clearest, concise and yet an exhaustivestatement in a certain sense, a thorough introduction to the course of the evolution of architecture, in reference to its history, its construction and its styles. I have heretofore vainly endeavored to find in so rich a literature for the history of art a work, that should entirely satisfy these requirements. A series of otherwise excellent publications, if they comprise the entire domain of architecture, by their great extent are entirely unsuitable for thorough study or for rapid information, or they are substantially limited to the principal architectural works in historical sequence, without more closely examining the roots of the architecture and the intimate psychological connection of its forms of expression with the culture and and intellectual life of the different peoples and periods. the most common manuals of the history of art, with all other advantages, are less favorably arranged for those seeking instruction in the evolution of architecture, since they chiefly treat of the entire domain of the formative arts, thus of architecture, sculpture and painting in the same volume, so that one is compelled to procurea frequently extensive work, which presents the desired material in but a relatively small portion of its contents. There may nearly always be recognized an inclination to place too much in view the archaeological element and beauty for itself alone, thereby considering the monuments from a point of view, which does not satisfy in full measure the interest of the architect. For in his conception architecture does not owe its importance alone to its archealogical or to its purely esthetic merit. The practical purpose to be served by a structure is determinable in all architecture, and to the architect is generally no less recognition due, if he has found a perfect architectural solution for the problem set him, than to the formative artist, who more freely employs the means for express-

ing beauty. Indeed, the creation of the former should also perhaps be yet more highly valued as an art creation, since mastery under the restrictions of higher requirements places it in a domain, that limits the creative artist by no restraints.

The present work then within the limits of a concisely conceived manual will represent architecture by itself in its primitive connection with the general progress of civilization. It must thoroughly treat the grammar of form expression after the manner and ways, in which the different nations solved their architectural problems in accordance with local and contemporary opinions in art. But likewise for youths in architecture, by the development of the architectural treatment of ideas creating interiors, it must afford worthy evidence for the tasteful evolution of a feeling for space and the winning of an assured presentation of the interior.

The book uniformly comprises the entire domain of architecture. It considers the different periods, so far as they are of importance for their evolution in technics or form, and are characteristic of the culture and intellectual life of the nations in the respective ages. The selection, sifting and presentation of the material proceeds according to unified principles. Each chapter first presents the general bases afforded by the customs, culture and history of the nation. Then are examined the forces impelling to creative art, the architectural problems, the structural methods, the architectural treatment and decoration, so far as these were developed in the different periods. In conclusion are finally mentioned the most important monuments. Brief statements generally suffice for their description, since everything common to them in the form of interiors, architecture and decoration has already been thoroughly treated in the preceding.

The enumeration and consideration of the monuments do not follow architectural types, but in accordance with certain justifiable assumptions, that in a work particularly treating architecture from the standpoint of its historical evolution, architectural creations are to be considered and arranged according to their locations. The interest in native arts also constantly increases in all classes of the cultured world.

The selection of the monuments frequently produces difficulties by almost unlimited abundance. With reference to the purpose of the manual and the restrictions imposed by its extent, not just those works, that are to be named first in magnitude and architectural expenditure, but others are taken, that must pass for being especially characteristic on account of their design or development.

Large space is allotted to the illustrations of the monuments, which indeed present the most important evidence for the course of life of the various nations, and whose reproduction is of great value for the use of the book, in order also to give thereby as complete a survey as possible. To the publisher is therefore due particular gratitude, and he has also met my wishes most completely in relation to the printing.

The addition of bibliographies must have enlarged the manual undesirably on account of the vast abundance of materials. Therefore I believed that these should be omitted. The sources of borrowed illustrations are always given. An ample index to places, names and things facilitates use as a comprehensive work on the character of the different periods, architectural styles, the leading masters and their principal works.

For advice contained in public or private criticism, relating to any corrections and extensions, I shall be grateful. But I must indeed permit myself to hope, that the work in its present form may afford a reliable guide to the study of architecture, both for polytechnic schools as well as for private instruction, and that by the consideration of the artistic labors in past times and of the great deeds of the masters, it may afford to practicing architects and artists a strong impulse to original creation in the ideal world of our modern time.

Stuttgart. October. 1910.

K. O. Hartmann.

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1. Beginnings of art and basis of its evolution.

The earliest undertakings of primitive races in the domain of architecture and of art in general doubtless arose from the impulse to preservation innate in all living creatures, from the contest for existence. The most compulsory needs, that appear in the common life of mankind, are to be regarded as the primary causes, which could arouse the thoughts and forces of the aborigines for their own protection and the elevation and amelioration of their lot. A great superiority over his fellow men led the first builder of a dwelling to the idea to create such in the lack of a suitable shelter. This supremacy further expressed itself in the ability to distinguish his own product above that of another, and to give it a higher value by more careful treatment and more suitable decoration. Even incomparably higher appeared that intellectual power, that finally placed him in a position to select symbols and figures for it, by which he might reproduce his mental perceptions by forms.

As such naturally at first only the very simplest representations could be considered, that by repeated attentive observation or by the peculiarity of their appearance had been impressed on the memory with unusual sharpness. And among these at first could be represented only the most striking characteristics in awkward, exaggerated and senseless prominence.

It was certain, that the first example of actual civilization found imitation among the inhabitants in the endeavor to appropriate to themselves the advantages and benefits thereby obtained. In this manner must what was attained by the first act have gradually become by continued imitation a common possession of those living together, so far as a certain similarity in intellectual traits and capacities existed among them. But thereby the result attempted by the first sculptor to secure in his possession a predominance over his fellow men, was placed in question. He must again conceive a further advance, and from this mature the second artistic production by perfecting the first work and the invention of novelties, again winning an advance. Yet the new attainment did not remain in his sole possession; like the first, it found imitation

by those dwelling around him. By the continued transfer of the products to all men also came gradually the need of further development, for novelty. But thereby was also introduced the estimation of all art.

In this advance of art must always stand in the foreground of artistic endeavor certain characteristics for its conception, and must first pass into representation, and indeed at first with faulty knowledge, with exaggerated prominence of marked peculiarities, but gradually with more accurate observation and increasing technical ability leading to ever more complete expression, until finally after long struggles was won the conception embodying the ideal type in perfected form. Thereby was attained the end of a definite period of evolution; beyond it improvement is no longer possible.

But since the endeavor for new creations also further remained effective, this no longer continued to be concentrated upon the characteristic meaning of the representations, which were already represented in an exhaustive manner; the attention must then be directed to less important matters, to subordinate and accidental things, with which the ideal type is equipped and in a certain sense is covered. There then appears a reaction in its characteristic appearance; the evolution of art itself moves in reference thereto in a descending line.

The normal progress of a tendency in culture and art here considered naturally could only pass into mature and complete development, when the necessary assumptions are provided for this, particularly uniformity in intellectual change, in the external conditions of life and the means for artistic representation. But this is only then possible, when a race can develop within unlimited borders and free from foreign influences, i.e., within a closed domain of civilization. In this case the art born therefrom also in all points corresponds to its own primitive presentation. Among the different races, that developed **thus** in isolation, must the species of arts become as diverse when compared, as the before mentioned bases whereon they were developed. Thus we see from this:-- the art evolved by a race within an isolated civilization is al-

always an acquisition, which must invariably proceed from its intellectual conceptions and opinions, its conditions of life, and the means at command for artistic expression. And especially when in otherwise different civilizations a similarity in the basal conditions is found, must this likewise appear in the art. But further must also every change in this basis by the acceptance of foreign ideas, the invasion of other customs and habits, the alteration of external living conditions, the use of later means, such as particularly result from the influence of foreign civilizations, must likewise produce a corresponding reflection in the civilization so affected or invaded.

The adoption of the possessions of a foreign civilization into its own culture is of high importance for the evolution of art. It follows in the manner already indicated in the consideration of general progress. Of the new motives will those be of especial interest and find acceptance, for which already bases and analogies exist in the native conceptions, since they alone can be understood and correctly appreciated. Elements not understood are slightly or never considered and remain without deeper influence. But even the new impressions will at first only impart their characteristic indications. For reproduction the power of memory is determinative, which still remains entirely under the influence of previous conceptions, and which then only places the new in relation to the old. In reproduction then appears the freshly adopted types permeated by the racial conception; they are in a sense cast in the old forms. On the internal relation of the intellectual significance of the new ideas to the racial civilization and the intensity and duration of its influence will it depend, whether a permanent transfer of elements of a foreign civilization results and passes into development in a normal course of evolution, or whether an unsubstantial and transitory fructification follows, and the foreign elements are again gradually dropped.

The bases for the evolution of art here considered directly explain to us the most essential forms in the art creations of the peoples in their psychological relations. They enable

us to recognize the primitive facts in isolated civilizations, especially in the early stages of evolution the striking efforts for perfection attaining their climax, as also the very important process of change, that results as the inevitable consequence of the affecting or invading civilization.

If we now go further into the kind of artistic activity itself, then as we have already seen, as the earliest originators appear conception and memory. Originally connected with direct impressions, they first produce reproductions, when they seek to again produce in a representation characteristics retained in the memory. But later by a combination of observations, by extension of unclear conceptions, result by the power of memory and of thought more or less novel, creatively produced works, thus originated by the formative power (imagination). Then if these extend over the interior and objects in space, they are so productively represented in hard materials or large size or in one perceptible by the sense of sight, that thereby the image originating in the imagination is realized or made visible in the actual material. At the same time is also thus restricted the effect of this portion of a all art, that we understand by the name of "formative arts". They are developed in three ways:-- in the creation or rather the enclosure of interiors by means of covering, combining a and forming suitable materials by architecture:- in the embodied representation of the ideal forms of the imagination with the corresponding form treatment of solid materials by sculpture or carving, and in their representation by means of drawing and color on a surface for producing the external appearance (illusion) of physical existence by painting.

Yet not all works produced in this manner are classed in the domain of the formative arts. In particular can an architectural work required in reference to actual purposes pass for an artistic fact not without something further. It only becomes such, if not only the basal idea be apparent and be strikingly expressed, but also with such a conception, that it directly produces pleasure, joy in the perfected handling of form and the invention of the beautiful, when the architectural work rises into the realm of the esthetic. This pleasure in the beautiful, in the esthetic, is a product of that

mysterious force innate in all mankind, by which originates the previously mentioned capacity for reproducing mental conceptions and intellectual ideas in form; it is called out by an architectural work, if the solid, hard and dead materials there employed are so imbued in all their parts by the formative artistic imagination, that they are idealized, receive an organic form, and appear as a whole with a rhythmic alternation of living forces. Architecture there experiences great transformations, when it regards the architectural masses in accordance with the image conceived in the artistic imagination, develops them separately and places them in such mental relations, that the work produced represents a perfected organism complete in itself, on which the different parts represent necessary members, which are harmoniously developed for the whole and for each other, embodying statical life and the mastery of forces.

These members are not only characterized by their general form as receiving, supporting, bearing or crowning parts, but also especially by corresponding transformation and treatment of their external surfaces. Herein the formative spirit now goes so much further, it proceeds with so much greater care in the selection of the materials as well as in their treatment, the more elevated appears the purpose of the building and the higher the requirements in esthetic respects. To enhance the effect of the **structural** forces and of the artistic expression, the forms imperceptibly pass into ornament, that consists of motives of a technical character in relief or painting, or of forms taken from organic growth and life, in which the functions of the structural members receive a symbolic expression, and in which they blossom in a manner. For the same reasons color is also added for the ornamentation of important parts, and thus by the colored accenting of the quality of the materials employed is heightened the illusion of organic life. There, where is particularly conceived the clear and speaking representation of the idea lying at the basis of the structure, or where the purely esthetic impulse appears in the foreground, even sculpture and painting enter into the service of architecture more extensively. The latt-

latter exerts a deep influence on these two sister arts, dominates them almost entirely in certain periods, and impresses its own characteristic stamp upon their effects. Thus architecture appears in a certain sense as the mother of arts, and which, fertilizing, guiding and determining, influences all stages of evolution in the progress of the formative arts.

Since architecture is a product of the power of perception, thought, and of the general imagination, and in esthetic effects is based upon the inventive life, its evolution is most closely connected with the tendency and relation of mankind to the divine, to religion. Religious representations of the fear and veneration of God are its highest problems. In the buildings for religious worship also lies among all civilized nations the focus of artistic creation. Therein is developed for a race in a certain period a characteristic art style, which we understand under the term "style". This ~~also~~ always results from similarity in religious and customary opinions, in the artistic problems and the means and technics selected therefor; it comprises the entirety of all laws, rules, types and forms, in whose consistent use the particular race found the most direct and complete expression of its intellectual ideas. But conversely we also see in a definite style the basis of the opinions of its entire period expressed in form.

In the origin of styles, whose rise to the climax and fall into decadence in its free and unrestricted development, as well as in the influence of foreign civilizations, we can follow all those transformations, to which we have already referred in mentioning the general process of the evolution of art in isolated and in intersecting realms of civilization. Thereby is also explained the high importance of the monuments as the milestones and measures of time for the periods of the development of the nations, and as documents for the entire history of mankind.

II. Architecture of Primitive and Natural Peoples.

1. Architecture of primitive races in prehistoric times.

In the darkness of countless thousands of years, through which the primitive beginnings of the human race extend backward, according to the existing condition of scientific investigations, the hypotheses of the natural sciences can throw but little light. Even into the diluvial formation of the earth can we follow the vestiges of human activity, to that time when the extension of the polar climate southward resulted in the ice covering of a great part of the northern hemisphere, i.e. in the so-called early ice period.

Already in this gray primitive time men made use of fire; charcoal and fragments of flints are the finds in this formation. From thence until the entrance of the races into the domain of verified history, they pass through a course of development, only to be measured by great periods of time, which in detail were passed over with very unequal rapidity. Thus the inhabitants of Europe found themselves still in their primitive condition at a time, in which the ancient Chaldeans in the East had already reached the climax of their civilization, while the North American Indians and the islanders of the South Sea at the first contact with Europeans still remained in the first stage of the evolution of prehistoric mankind. But most of the primitive races in the prehistoric period exhibit a course of development similar in its main lines, so far as it may be recognized in the prehistoric civilization of the inhabitants of middle Europe. These already afford a greater interest for us and also present us with the possibility of confining the different periods of prehistoric time within great outlines. Their stages of development will be best characterized by the materials from which the aborigines chiefly made their tools and weapons, with the perfection of which the advances in civilization were directly connected. Accordingly as a rule, three great principal divisions are assumed for prehistoric time, the stone, bronze and iron periods.

The beginning of the stone period is lost in the impenetrable darkness of remote antiquity; its end can be assumed for Europe in general at about 2000 B. C. In this stage the use of metals was still unknown. Tools and weapons chiefly cons

consisted of stone. The mode of preparation of the latter allows us to divide the stone age into earlier (paleolithic) and later (neolithic) periods. In the earlier stone period the stone tools were still very rudely made by breaking and chipping, but in the later one were already ground and polished.

So far as their vestiges may be recognized on European soil, the men of the older stone age (paleolithic period) were still hunters and fishers, who dwelt in natural or artificially enlarged caves, beneath overhanging rocks, or the projecting leafy shelter of great trees, in covered trenches in the earth, and also perhaps in tents of stakes and the skins of animals. These unfriendly dwellings would afford no interest to us, were it not for the remains of the first stage of human activity found therein, that exhibit in human and animal figures carved in relief and extremely animated drawings of animals, which were incised with flints on bones and reindeer horns. The objects also already exhibit ornaments, consisting of incised lines, rows of dots, zigzag patterns, waves, interlaced bands and the like, in which we recognize the lowest basis of ornamentation.

In the later stone age (neolithic period) the people reached a much higher stage of civilization. The ice had receded farther northward; Europe had assumed approximately its present form with the existing climate. Stone objects were made with greater care; already became apparent an endeavor after artistic treatment of form. Men were not only busied with hunting and fishing, but also with the breeding of animals and likewise very soon with agriculture. They had learned to weave mats, to make fabrics for clothing the body, and to shape clay vessels and burn them in the open fire. Even yet were caves utilized as dwellings, or artificial excavations in earth were made with circular or rectangular areas. Yet there likewise appeared the most primitive form of the house construction in the erection of huts of stakes with wattle and clay covering, covered with reeds, rushes, the bark of trees or straw. Where the possibility offered, these huts were built on pile scaffolds in the shallow margins of lakes,

manifestly for the better protection from surprise and for more convenient fishing. (Fig. 1).

Or such pile structures there still exist the remains of entire villages, that formerly rested on piles above the water level, and were connected to the land by narrow bridges. In them appear the earliest productions of the science of carpentry.

The beginnings of stone architecture also extend into the neolithic period. But we find them not in dwellings, but in the resting places of the dead, that chiefly by the care and indication of burial places give evidence for the dead already extended among the aborigines of the later stone period. The deceased was placed in a reclining or seated position in natural caves or in tombs composed of great stone slabs and covered by a colossal block of stone (Fig. 2). When these stone structures are detached, they are called dolmens (stone tables), but Huns' graves in northern Germany, where a mound of earth (tumulus, barrow) is generally raised over them (Fig. 3), and passage graves, if a special passage leads to the tomb chamber. Other megalithic (great stone) monuments are rather to be regarded as symbols of religious conceptions, such as the menhirs (long stones) generally occurring in France, that are set up vertically as colossal isolated stones (a menhir in Brittany is 72.2 ft. high), and the cromlechs (stone circles) formed of one or more concentric circles of menhirs, of which the anciently venerated Stonehenge (stone enclosure) near Salisbury in southern England forms the most famous example of this kind (Fig. 4).

A new period came in for prehistoric mankind with the knowledge of metals and their uses. By this was introduced the bronze period, whose beginning in middle Europe is to be placed at about the commencement of the second thousand years B. C. Of the metals, in most domains, men at first recognized copper as a malleable stone, then its fusion with tin into the harder bronze, infinitely more suitable for use in tools and weapons. The forms in the earlier bronze period, extending to about the year 1000 B. C., are similar to those of the stone age, but are always richer and more artistic. An abundance of novel ornamental forms arise. The ornament is indeed

chiefly geometrical ; but the flexibility of the metal, and especially the making of wire leads to the extensive employment of curved and recurved lines, especially of spirals, whose treatment exhibits an overpowering feeling for beauty of lines, uniformity and symmetry.

The later bronze period, that in middle Europe falls about in the time from 1000 to 700 B. C., is characterized by a development of forms evolved entirely from metal working, an enrichment of technical processes, and an expression of enjoyment of pure decorative art, a knowledge of which is afforded by the numerous and excellently preserved finds in tombs, the luxuriantly ornamented weapons, utensils, and ornamental objects of all kinds.

For the technics of house construction, the obtaining of metal tools indicates an unexpected advance. The former connection of timbers by bast and branches were then replaced by intersections and tenons. Pile structures were perfected and in part were also transferred to the land as such, for example in the plain of the Po, where they formed pile villages, that were already enclosed by wall and ditch. In the further course of the bronze period, domestic architecture experienced a continued transformation, and in the later bronze period, it had already assumed fixed standards, given for us by the so-called house urns of burned clay, that served to receive the ashes from the cremation of bodies, generally common in this period. Their external forms should be regarded as imitations of the dwellings then common (Fig. 5). We can follow in them the entire course of the evolution of the oldest house architecture, from the simple circular and conical cave dwelling set into the ground with steep conical roof and elevated entrance doorway to the circular hut with flat and dome-shaped roof, and a lower doorway to the rectangular structure with high hip roof, still without a ridge, and finally to the elongated plan of the peasant's house with hip roof, in which the ridge and the series of rafters already appear. This house chiefly contained but one room, in the midst of which was the hearth. Yet examples are also already found with a division in the interior.

In the 7th century B. C. was introduced a new metal in middle Europe by the trade routes, probably from the southeast, iron, which soon almost entirely supplanted bronze. Then begins the iron age, the last stage of prehistoric civilization, that extends down into our chronology. Likewise in this may be assumed two divisions plainly separable by the peculiarities of the artistic use, an earlier and a later iron period, that as a rule are named from the two localities of the finds, at which the most important remains of this period were brought to light.

The earlier iron period or Hallstatt stage, so named from the cemetery of Hallstatt in upper Austria, falls during the time from 700 to 400 B. C. Iron gradually supplanted bronze for weapons and tools, while the latter was retained for utensils and ornamental objects. In ornamentation becomes perceptible an introduction of foreign motives into the native decorative art, but which is transformed in accordance with the popular taste. Everywhere appears a fresh feeling for animated curved lines with geometrical and circular interlaced bands, into which are woven representations of figures, especially terminations in the heads of birds, horses and cattle. We have no definite conception of the architecture of middle Europe during this period, since the buildings were almost everywhere constructed of wood and have entirely disappeared, and from the remaining walls of fortifications sufficient starting points cannot be obtained for the forms of that architecture.

The later iron period is also named La Terre stage (400 B.C. to 100 A. D.) from the place of its most famous find at La Terre at the northern end of Neuenberg Lake in Switzerland, where in the ruins of a very ancient blockhouse was found a mass of iron weapons, tools, utensils and ornamental articles. During this period the working of iron passed into full development. The forms themselves were considerably simpler, in accordance with the more difficult working of the metal; their ornamentation chiefly consisted in a new system by the incising of patterns and filling these with enamel. The decoration forms a peculiar and clearly expressed style, that freed itself from the geometrical basis and is lost in an arabesque

(page 214) of interlaced bands and network, in which the bodies of snakes, the heads and feet of birds and fanciful animal forms as terminations were woven together with astonishing inventiveness in an inexhaustible variety.

The civilization of La Terre was chiefly extended by the Celts (page 140 and note on page 168) throughout Switzerland, France, upper Italy and the East of Europe. Nothing more of their architectural works is known to us. What the Roman historian Tacitus states concerning the wooden houses of the Germans already appears to us in the light of historical tradition.

2. architectural of peoples in a natural state.

For the conditions of civilization in prehistoric times instructive parallels are presented to us in the conditions of those wild races, that even in our days have remained at the stage of evolution of prehistoric mankind. Even today thousands of Australians, Fuegians, Indians and negroes still dwell in shelters afforded by nature or erected by themselves, like the aborigines of the earliest stone age, and they also employ the same tools and weapons as those. Other wild races have risen above this condition to the level of the neolithic period and of the earliest bronze age and build huts in similar forms to those previously considered. (Fig. 6). A certain high position among peoples in a natural condition was attained by certain races of aborigines of Africa and central America, who relatively early obtained metals and learned to work them.

In Africa already existed, when the first Europeans came there, great and powerful negro kingdoms with their own civilization, that chiefly manifested itself in a very skilful working of bronze and the art of wood carving. In their domestic architecture indeed they scarcely passed beyond the most primitive form of the circular hut constructed of stems, reeds and branches with a conical tent roof.

In America certain races, especially the Mexicans, the Peruvians and the Mayas formed independent civilizations, that had already advanced into the bronze period at the invasion of the Spaniards. At least they were acquainted with different metals and had learned to work them, even if their weapons and tools still chiefly consisted of stone. Among them even the bases of the sciences and arts were cultivated, and arch-

architecture could already exhibit considerable works in the construction of temples, palaces and tombs. One finds there among the ruins of ancient American civilization the stepped pyramids as substructures of temples, terraces of palaces, as well as purely tombs. Their palaces exhibit by the vestibule galleries and spacious courts, about which are grouped the halls, and particularly by the entire construction of the masonry in airdried bricks with stone facings, numerous similarities to the oldest buildings in Asia Minor, while the ornamentation exhibits almost the native wealth of forms of the prehistoric races, certainly in a usually overcrowded use, recalling the luxuriance of the decoration on East Indian architecture.(Fig. 7). But in mural painting and the technical arts (weaving, ceramics, goldsmith's work), they made advances, that rise far above the undertakings of the wild people of nature.

The examination of the art of aboriginal and natural races teaches us, that all and even the most primitive creative occurs directly employed by art, that this appears both as a result of general conditions of life as well as of the peculiarities of the different races of people, and always reflects their religious conceptions, that likewise their ornamentation as a decorative art starts from the endeavor for ornamental treatment of utensils and of the surroundings, and its types result from the observation of nature and the kind of technical procedure attained(wickerwork and the like), explaining numerous abstract and symbolic relations. Also in the art of interiors is already found the feeling for beautiful uniformity and symmetry, even if still unconsciously effective. Thus we recognize herein a certain culture possession, that in accordance with the inequality of the natural tendencies of the races of people and the external conditions of their lives further developed in very different ways, and even now has scarcely gone beyond the wild natural peoples. But in the existing condition of the latter we have a very valuable support for our conception of the dreary dwellings of prehistoric peoples, into which one must descend in order to reach the earliest start of the roots from which grew the art of civilized nations.

III. Architecture of the Egyptians.

1. General and historical basis.

The great flight of mankind to a higher civilized and art life prevailed in the blessed river valleys of the Nile and between the Euphrates and the Tigris, in Egypt and in the ancient Mesopotamia. Even deep within the fourth thousand years before our era extend back the historically verified monuments of ancient Egyptian art, and the remains found on Asiatic soil may be referred back to a still earlier time, according to the results of recent investigations. But in a description of architecture Egypt deserves precedence, for there in a quite unusual number of well preserved monuments is unrolled a very perceptible and comprehensive picture of the evolution of art during nearly three thousand years, which can be presented only in a very imperfect manner by the remains of ancient Babylonian architecture preserved only in few and disconnected ruins.

The land of Egypt forms a deeply cut valley between bare and desert plateaus on both sides of the Nile valley, that nowhere on earth finds its parallel in natural conditions. Year by year in the late summer months the mighty stream rolls its masses of water and mud, overwhelming the entire valley, in which rain is a rarity, bring to it coolness and moisture and fertilizing the soil, so that without requiring great preparation it affords a rich return. Such a fortunate land must quite early lead to agriculture, to the founding of permanent settlements, and to the greatest possible protection against foreign invasions.

The people dwelling here in the historical period came from native races previously living there. Which one of these formed the aboriginal population and immigrated (according to all probability from Asia), is still an open question. Industry, great energy, practical sense and sagacity are the bases of its characteristics, but beside these stands only a one-sided art imagination. The ground conditions indicate to the separate races from the beginning the collection of forces, the necessity of subordination to the general interests, and thus arose very early in the Nile valley that monarchy based on fixed order, in which the kings (Pharaohs) were revered as

gods, and were clothed with power, that placed them in condition to develop to the highest extent the supernatural sense, already in the people by the everlasting mighty contest with the forces of nature, and to personify it in grand architectural ideas. All power was united in the king, both spiritual and secular. By the races of kings (dynasties), the Egyptians determined for themselves the entire chronology.

In the history of Egypt are generally assumed five chief divisions:- the Early period until the 3rd dynasty (about 2800), the Old Kingdom of the 4th to 6th dynasties (2800 - 2500) with the capital at Memphis in lower Egypt. Then followed for three hundred years a period of decadence and of separation into distinct races, until a Theban dynasty again restored the united state, the Middle Kingdom of the 11th to 13th dynasties (2200 - 1800). This period found its end in the invasion and supremacy of the Semitic nomadic race of the Hyksos. After their expulsion was founded the New Kingdom of the 17th to 20th dynasties (1600 - 1100). Thebes in upper Egypt became the capital; Egypt under Ramses II attained its climax and the apex of its political power. Under his successors began its decadence. The country first passed under priestly rule, with which set in a continually progressive weakness and disintegration, until dependence upon foreign conquerors could no longer be avoided. Yet again under the Saitic kings of the 26th dynasty, who resided at Sais in lower Egypt, came a period of national elevation. But it was of brief duration. The internal strength of the Egyptian people was destroyed. In the year 525 the Persians, in 332 the Greeks (Alexander the Great, and after 306 the Ptolemies) acquired sway over the country, and after it had finally sunk into a Roman province (30 B.C.), there also gradually disappeared the last forces of the once splendid Egyptian civilization.

Upon the entire civilized development of Egypt religion exerted the deepest influence; it culminated in the personification of natural forces, in the veneration of certain animals as symbols of the numerous deities, and in the deeply rooted belief in a continuance of the human soul after death, indeed with all the needs of mankind for food, drink and the like, so long as the body remained preserved.

2. Evolution of the architecture and the monuments.

Egyptian architecture proceeded entirely from the service of religion. For the ancient Egyptians the most important problem of life consisted in the construction of an indestructible tomb, in which after death its ka, i.e., its spirit double, could again unite with the body and thus participate in the joys of life eternal. Therefore the corpse must be prevented from decaying as far as possible (mummied), be concealed in deep excavations, and be protected from any destruction by a solid superstructure with carefully concealed doorways. This then led to the grand sepulchral architecture of the Egyptians, the mastabas and the pyramids. These are isolated structural resting places (tombs), the former for the great men of the kingdom, the latter for the kings. By this tomb construction the entire art of the early period was dominated. In the middle kingdom the dead were but rarely placed in pyramids and mastabas, but in rock-cut tombs, which as vaults and corridors were wrought in the steep precipices of the limestone hills enclosing the Nile valley. In the new kingdom, that coincides in time with the epoch of the great commerce of the nations, so highly important to the evolution of oriental art, to which Mycenaean civilization likewise belongs (pages 52, 54), the monumental creations of the Egyptians received a new and grand expression in the temple architecture. The Pharaohs beheld their most earnest duty in the erection of eternal dwellings for the gods, by this fulfilment obtaining their good will. Thus arose buildings for the gods, indeed both detached temples as well as rock-cut temples, which in their solemn majesty, in their amazing boldness and magnificent design represent the climax of not merely Egyptian art, but of all the architecture of oriental antiquity. Here also came into full development the system of construction with free supports and horizontal beam ceilings, basal for all later architecture, that of column and architrave construction. The late period produces no new architectural types; its monuments entirely indicate a return to the original forms of the older and the middle kingdoms.

A monument of great importance for the early period is the Tomb of king Menes, the founder of the first dynasty. It con-

consists of a massive nucleus, arranged in the form of a rectangle about 42.7 ft. wide and 131.2 ft. long, containing the sepulchral chamber in the middle with storerooms at each side, and of an external protecting and covering structure measuring about 82.0×173.9 ft., whose sides are inclined and are formed like a series of separate piers. Bricks were employed as the material for this, made of Nile mud and dried in the sun.

An advance from this design is shown by the later detached tombs for the kings of the first and second dynasties, whose form also gradually passed into the tombs of the prominent Egyptians of the old kingdom. The latter were subsequently mostly grouped around the pyramids and there have the appearance of benches, from which they received the Arabic appellation of "mastaba" (bench). (Fig. 8). In these are further added to the before mentioned chambers a living room and a room for prayer (tomb chapel) for the deceased. In a richer construction they received a grave chapel in which the offering to the dead was placed. At the rear of the chapel is always a false doorway, to personify the entrance to the realm of shades. The sepulchral chamber itself is sunken deeply into the rock and is accessible by a shaft, that was carefully filled with masonry after the burial. In such a mastaba of the 6th dynasty (about 2600) is found the perfected technics of vaulting with voussoirs over a passage leading down obliquely to the tomb chamber. (Fig. 9). Bricks of Nile mud and rubble stone masonry form the material, later cut stone, the latter especially for the external facing. Externally the mastabas represent rectangular and box-like stone structures with battering walls and flat stone roofs without subdivision. Greater interest is afforded by the false doorways, in whose treatment may be recognized the imitation of a very ancient wooden architecture (Fig. 10).

Under the 3rd and 4th dynasties originated the form of the pyramid, characteristic for the burial place of the Egyptian kings. These show us the primitive type of sepulchral mound (tumulus), transferred to stone and restricted to a fixed geometrical form. In their overpowering magnitudes these colossal structures still appear as dumb witnesses for the incomparable power of the monarch of the kingdom of the Phar-

Pharaohs. To nearly the number of a hundred, they stand on the elevated plateau of Memphis (near Cairo) for an extent of about 46.5 miles along the border of the Libyan desert in several groups, that are generally named from the villages of Gizeh, Daschour, Saccara etc., lying in their vicinity. The oldest form of the pyramid is explained as a directly increased magnitude and height of the royal tomb of the 1st and 2nd dynasty, the so-called mastaba. (Fig. 11). If the nucleus be arranged in accordance with the dignity of the king in relative height, and the enclosing structure then be constructed in offsets, there results the stepped form of the pyramid, as the earliest examples of which are to be regarded that of Saccara (of king Zoser of the 3rd dynasty), at which even the rectangular ground plan of the mastaba is retained. The pyramid of Snefru (succeeding Zoser as the first king of the 4th dynasty) near Medum already passes to the simplified form and has a square ground plan. As an intermediate form appears the hipped pyramid of Daschour, whose sides are broken in an obtuse angle (Fig. 12).

Classical perfection is shown by the three giants at Gizeh, the Pyramids of Cheops (Chufu), of Chefren (Chafra) and of Mycerinus (Menkaur), the first of which was 480.7 ft., the second 454.4 ft., and the third 217.9 ft. high. The internal construction in regard to the arrangement of the rooms and the access may be seen by a section through the pyramid of Cheops (Fig. 13):- the subterranean tomb chamber, sunk deep in the rock, a middle one, the so-called queen's chamber, over which is the actual royal sepulchre, that is lined with accurately joined and polished granite slabs, and whose ceiling was carefully protected against pressure by five relieving chambers lying above each other. The great inclined gallery measures 154.2 ft. in length and 27.9 ft. in height; its ceiling is formed by corbelling, i.e., by stepped projection of the ashlar courses. But the other passages are so narrow and low, that they can only be passed in a stooping position. The sepulchral chambers were protected against intrusion by ingeniously conceived sliding stone construction, and the entrance on the exterior was concealed with the utmost care.

The masonry consists of bricks or split stones with lime mortar, the external covering was of dressed ashlar of limestone and sometimes of granite in the lowest portions, with very accurately executed bonding, so finely polished, that the joints are scarcely to be seen. For the practical handling of the great loads in transporting the colossal blocks, special inclined ramps were constructed of bricks.

At the eastern side of the pyramid was erected a separate tomb temple for the actual worship of the dead, on which the construction with horizontal stone beam ceiling on detached stone piers occurs, historically important in the history of architecture; but the latter have no members. Near the pyramid of Cheops stands the great Sphinx (Fig. 14), a colossal statue 131.2 ft. long and 67.0 ft. high, carved from a rock in the form of a reclining lion with the head of a man, that according to one assumption is to be explained as a symbol of the sun-god Ra (Ra), but by another conception passes for a fear inspiring guardian of the tomb. Its origin however does not fall in the same period with the pyramids, but in the succeeding one. (The expressive facial traits must be those of Amenemhets III, of about the year 1900 B. C.).

In the middle kingdom the building of pyramids and mastabas gradually receded into the background. In upper Egypt, particularly in the cemetery at Abydos, the pyramidal form, yet certainly in very small dimensions, became the type of the private tomb, enclosing the rooms common to the mastaba; the chapel of the dead is built before it. Elsewhere the dead were chiefly buried in rock-cut tombs. These chiefly have a frequently narrow and deep vestibule (Fig. 24), an internal rock-cut main hall of a square or rectangular ground plan, from which a carefully concealed shaft leads to the sarcophagus chamber (sekos) lying beneath it. In the rear wall of the hall is found a niche with the statues of the deceased. The ceiling is flat or vaulted and is frequently supported by two rows of piers, so that the interior appears in a manner divided into three aisles. At the rock-tombs of Beni-hassan (about 2000), the entrance to the portico, open in front, each has two detached columns, that have a very flat circular slab as a base, an eight or sixteen-sided shaft, slightly diminish-

diminished upward (partly with shallow flutes on the different vertical sides), and an undivided square abacus. This ~~form~~ is still found in the extension to the great temple at ~~Karnak~~ erected by Thutmosis III (after 1500). (Fig. 15). It has received ¹⁸the name of "protodoric column", although it is not to be assumed, that it served the Greeks as a model.

In the new kingdom the dead were likewise and indeed exclusively buried in rock-cut tombs, that extended in long passages (syringes) into the rock and frequently were of great extent. But these only present particular interest by the meaning and the splendor of the representations on the internal walls (Fig. 24), which relate to the belief of the Egyptians in the wandering of the soul and the judgement of the dead. The centre of the artistic activity of this period of the climax of Egyptian civilization and art lay in the temple architecture. The capital of the new kingdom, the "hundred-gated" Thebes, became its centre of magnificence.

The ground plan of the temple, that should be a dwelling for the god worshiped therein, is substantially derived from the Egyptian house, in which a court with a portico, a wide hall of small depth lying opposite the entrance, and behind this a narrow though deep room form the chief parts, to which are connected the subordinate rooms, sleeping chambers, kitchens, rooms for the servants etc., the entire structure itself lying in a court surrounded by an enclosing wall. Corresponding to the religious conceptions of the Egyptians and to their monumental tendency, the temple design increased to the colossal. Only the best and most durable materials were employed for the construction.

The Egyptian temple stands in the midst of a widely extended area enclosed by a wall, the temple precinct, to which leads a wide paved ~~avenue~~, the dromos. This exhibits a street formed to two rows of sphynxes, that was adorned by stately gateways at proper distances, and this is particularly emphasized as a festal avenue for the processions, important in the Egyptian service of the gods. The typical basal form of plan and elevation of the main building is shown in general by the temple of Chensu or Chons at Karnak (Fig. 16). On the exterior

On the exterior the great doorway always indicates the chief effect of the temple. Before the facade stand two obelisks, i.e., four-sided, slightly diminished upward, pillars cut from single stones of unusual height, and behind these also at both sides of the main entrance are colossal statues with the head of the royal founder. The entrance itself is flanked by two massive gateway towers, the pylons, which rise on narrow rectangular transverse areas and with inclined sides.(Fig. 17). On entering the temple one first passes into an open and nearly square court surrounded by porticos, the peristyle, and then into the hall of columns (hypostyle hall) occupying the entire width of the court, that by the enlarged and higher middle pairs of columns produces an impression of three aisles, and in its development indicates the climax of Egyptian architecture. Through narrow light openings in the structure above the columns adjoining on both sides, this interior receives a dim mystical lighting. Behind the hall of columns on the axis of the building, directly or connected by chambers and porticos, lies the sanctuary proper (adyton, sekos, sanctuary), a narrow though deep, dark and low apartment, in which was placed the image of the deity. Around the sanctuary were grouped subordinate rooms as living rooms for the priests.

The construction and treatment of forms shows us the first example of an orderly developed and richly membered stone construction, whose centre lies in the column and architrave construction. Of Egyptian columns, we have already mentioned the protodoric columns, developed from the four, eight or sixteen sided stone piers. Besides these further occur a great number of peculiar forms, that are derived less from structural reasons than from ornamental respects, and whose models are to be directly sought in the plant kingdom. These are termed plant columns, differing according to the basal motive as the lotus, papyrus and palm columns.(Fig. 18). They almost always have a wide, low and circular base slab (base), a single shaft (shaft), or one formed of a bundle, generally diminished upward and with enclosing annular bands and a head (capital), with the form of an open or closed flower, a blossom or palm corolla. The oldest of them and the most important for all periods of Egyptian art are the lotus columns (Fig.

18 A). They already occur in the old kingdom, indeed with a closed capital and clustered shaft, and also with the open lotus; the capital there has a but slightly developed form. The papyrus columns are recognizable by the flower corolla surrounding the shaft above the base and by the swelling of the shaft, and also by the sharp edged stems on the clustered shafts, are common in the middle and new kingdoms with both closed and open flower capitals (Fig. 18 B), and likewise the palm columns with round diminished shafts without leaves at the base or the swelling. On these may be most clearly recognized the direct derivation from the plant form. From the open papyrus bell capital comes the corolla capital, and by its further development the scroll capital with volute forms in relief (Fig. 19). In the middle kingdom also occurs a peculiar form of the capital of the column frequently employed in the succeeding period, the Hathor capital, that shows the face of the goddess Hathor on two or more sides, and in its later shape with an abacus in form of a temple exhibits the complete degeneration of the style.

The ceilings are entirely constructed of stone, the columns being connected by beams (architraves) laid on them, these being then covered by slabs. From the unusual magnitude of the Egyptian temple and the weight of the masses, a great number of closely set columns are necessary. The Egyptian wall (Fig. 17) also evidences in its exterior the original construction with tamped and dried Nile mud, with wattling of rushes and wood; hence the disproportionate thickness and the battering, which was customary with the Egyptians in the construction of Nile dykes, the covering in the earliest period by mats or strips and woodwork, later with stone slabs, and the lack of all subdivision with the exception of the upper termination by a half round and a strongly projecting eavetto (this being probably derived from the native people, serving as a head ornament), by which was created the primitive form of an architectural crowning. Likewise the entrance doorway (Figs. 17, 20) receives as its upper termination a half round with cavetto, on which is found the symbol of the god Horus, the uraeus serpent in the winged disk of the sun. The half round extends

21 down the side angles of the walls, indeed as a reminiscence of the former mat or cloth holder, transformed into stone, or of the wooden moulding by which the ends of the strips were covered.

All walls and generally all visible surfaces are very richly covered by painted representations in relief, in which hieroglyphs, the characters of the ancient Egyptian writing play the chief part. (Fig. 17). They narrate to us with great perspicacity the interesting history of the Egyptian royal families. Their purpose was to tell a story and not to produce a purely esthetic effect by beautiful forms or colors; clearness and legibility were the highest aims, and hence the sharp expression of the separate letters and the rigid adherence to the types once adopted. The body and all its limbs were represented in profile almost after a pattern, the principal figures being emphasized by a corresponding magnitude, all lying in the surface, without any regard to perspective foreshortening. The colors were employed as far as possible uniformly as a means of enhancing the legibility and clarity (Fig. 24).

These principles are expressed in nearly all works of monumental sculpture and painting. They exhibit an extremely acute observation of nature, but chiefly present types and symbols and thus are characterized as monumental inscriptions in stone, that on grand lines with color and form in a severely restrained architectural spirit and uniform style feeling were transferred into the domain of the formative arts.

Besides the hieroglyphics, motives for Egyptian ornament were also derived from the technics of weaving and embroidery, forms of stars, the zodiac and other astronomical emblems, winged suns, sparrow hawks and vultures, and from the plant world were chiefly taken the lotus flower, papyrus plant, nymphaea and water lily, sedge leaves and palm branches. In the arrangement of the ornamental work and the entire decoration of the temple is missed a gradation and enhancement in accordance with the purpose of the rooms. The uniformly sculptured and painted covering of hieroglyphics has the effect of a magnificent fabric executed in monotonous colors, stretched uniformly over all parts.

The greatest temple is that of Amon Re at Karnak, the highest undertaking of Egyptian art, a structure of vast extent, on which nearly all dynasties labored, whose columnar hall alone has an area of 334.7×167.3 ft. At the southwest it was connected by an avenue about 6562 ft. long, and formed by about 600 sphynxes, with the temple of Luxor, a creation of the new kingdom, which in size was not much inferior to the temple of Amon (Fig. 21). Besides these temples of the gods, in the vicinity of the rock-cut tombs of the kings on the border of the Libyan mountain range rose memorial temples (memnionium), among which the two tomb temples of Ramses II, the greatest builder of all the Pharaohs (named the Ramesseum) and of Ramses III in the Theban cemetery near Medinet Habu are counted among the most prominent architectural monuments of the new kingdom on account of their regularity and their equipment. (Figs. 20, 22).

Of these temples, partly constructed as detached buildings and otherwise as grotto or rock-cut temples, the memorial temple at Dahr-el-Bahri at the west of Thebes is the most important. Its front portion consists of porticos, placed on three terraces rising behind each other, while the sanctuary with the rooms appertaining thereto was cut in the rock at the top of the uppermost terrace. Among the true rock-cut temples, the two of Abu Simbel are the most important. (Fig. 23). They have vast facades entirely cut in the rock, that of the smaller temple having six standing colossal statues of Ramses II and of his wife, but that of the greater is dominated by four seated colossal figures 65.6 ft. in height. From the entrance on the facade passages lead far into the rock, whose walls are covered by paintings on stucco, relating to the terrors of perdition (Fig. 24), terminating in the inner hall of piers or columns and the sepulchral chamber, whose entrance was still carefully concealed. For even the rock-cut tombs have the purpose of concealing the sarcophagus to the utmost. In the hall of piers or columns of the first of the two rock-cut temples are employed Hathor capitals, but in the last temple temple are piers with colossal figures of Osiris, the god of the underworld.-- Of other works from the best period of Egyptian art should also be mentioned the labyrinth, celebrated

by Greek writers, a mythical wonderwork of the old world, but we have no clear representation of its plan and equipment.

In the decadence of the new kingdom departed the motive force of the creative spirit of Egyptian civilization. The late period produced no characteristic work. In the period of national uprising introduced by the Saitic dynasty (663 - 525), the creations of the old and of the middle kingdoms were imitated and the destroyed temples were again restored. The feeling for the monumental mass of colossal interiors receded; on the other hand a certain preference for richer decoration makes itself perceptible. The architecture indicates by this and by the return to primitive forms the stage of decadence.

During the rule of the Ptolemies Grecian art found admission into the land of the Pharaohs. But it could not master the inflexible colossal spirit of ancient Egyptian views of art and civilization, but only influence these in unimportant things. Alexandria, the capital of the new kingdom, indeed received a predominating Hellenic character. But in upper Egypt men remained faithful to the national architecture. The new monarchs favored it, and thus still arose under the Ptolemies some structures of importance, among them being the Hathor temple at Dendera, that of Horus at Edfou, and the charming group of monuments on the island of Philae. Likewise the Roman emperors followed in the footsteps of the ancient Egyptian rulers and erected works in their style. The splendid so-called kiosk at Philae is a creation of Trajan. (Fig. 25). Just in this do we see, that Egyptian art from the beginning remained faithful to its traditions as if by an iron law, until in the last stage of its course.

5 The importance of Egyptian art lies chiefly in the thorough development of the grand stone architecture of column and architrave construction and in the decoration of the walls by strongly conventionalized sculptured and colored representations from the domain of history and religion. -- In regard to its esthetic worth, it must be measured by its own scale; and then its works are numbered among the grandest and most magnificent undertakings of all times. For the history of evolution it merits our highest interest. During many thousand y

years did the ancient Egyptian civilization preserve its purity as in a severely isolated realm, until its promoters yielded in the contest with foreign conquerors, and the sacred primitive and once so flourishing Egyptian art was overwhelmed on its own soil beneath the irresistible stream of the Greco-Roman development of the world, rolling over the land of the Pharaohs.

IV. Architecture of Western Asia.

1. Architecture of the Babylonians and Assyrians.

Infinitely more than Egyptian civilization, the great river domain of Mesopotamia in western Asia has affected the history of the evolution of mankind. In the same manner as the Nile valley has it been fertilized annually by the vast overflows of the two rivers, and this country was densely populated between the rivers, but was accessible around them, thus being subject to great racial changes. In the southwestern portion, the ancient Chaldea, dwelt in the earliest time attainable in history (in the fifth thousand years B. C.) the Sumerians, a highly gifted people, allied with the Aryan races according to its language, that soon and in any case already about 2500 B. C. passed into the Semitic people, settled in the country near it. But the Sumerians are to be regarded as the true bearers of the civilization of the ancient Babylonian kingdom, whose climax falls under the rule of the mighty king Hammurabi (Chammurabi), who about 2200 united the entire lower river valley under his sceptre, and beautified his capital Babil (Babel, Babylon) in the most splendid manner. But in the second thousand years arose a dangerous enemy to this kingdom in the savage and warlike Assyrians settled in the northern river valley, likewise belonging to the Semitic family of races, who at last completely subjugated Babylon and founded a great power extending to the Mediterranean and Black Seas, the Assyrian world empire, that under Sargon II (722 - 705) rose to the highest power and civilization, but fell under Assurbanipal (Sardanapalus), and about 606 was overthrown by the invasion of the Medes and the revolting Babylonians. The Assyrian capital Nineveh was entirely destroyed and a new Babylonian kingdom was founded. Under Nebuchadnezzar (605) this attained the position of a world power, but only for a brief period. Weakened and shattered in its internal conditions, it was conquered by the Persian king Cyrus (Cyrus) and incorporated in the Persian empire.

The religion of the Mesopotamian peoples was based upon the Shamanism of the Sumerians, the belief that magicians (shamans) gifted with supernatural powers acted as mediators between

mankind and the gods, among whom Anu, the spirit of heaven and Ea, the spirit of the earth, represented the highest deities. To these were later added the god Bel (Baal), revered by the Semites as the ruler of the world and father of the gods, and the gods personified in the stars, among which to Istar (Astarte, Venus) as goddess of fertility was assigned a prominent role. Upon the evolution of architecture these religious conceptions exercised infinitely less influence, than in Egypt. A real faith in immortality did not exist, and a special worship of the dead had never developed. Consequently sepulchral architecture never received a monumental development. Grecian and Roman writers tell us only of temples and palaces; only these and the great works for draining and irrigating the land are chiefly indicated by the remains found up to this time.

The entire ancient Chaldaic and Babylonian architecture came from the Sumerians. Their primary works were great dams and dykes, planned for regulating the annual overflows, among which a drainage canal discovered in Nuffar (the former Nippur), whose origin is indeed to be placed far in the fifth thousand years B. C., was already vaulted with voussoirs. Of the structures of the ancient chief cities of Sippur (near the modern Tello), Agade, Ur and Babylon, exist only mighty ruins, that evidence an unusual love of the princes for building. Owing to the lack of natural stone, men used air-dried and burned bricks, for which the existing clay deposited everywhere afforded an excellent material, and the earth pitch flowing abundantly from the ground was a superlative binding and compacting substance. The entire structural system was determined by this material. The walls consisted of unburnt, air-dried bricks with wooden anchors and inserted reed mats, in the earlier period exclusively held together by asphalt, but later in the upper courses by clay mortar. On the exterior the walls were subdivided by an alternation of projecting and recessed vertical bands and by buttresses of rectangular or semicircular cross section. The visible external surfaces received plastering or a facing of burned or frequently of glazed bricks, or even a mosaic made of clay rods. The floors were generally paved with bricks. The ceilings were of wood

and apparently were always plane; over passages were constructed tunnel vaults. In the forms of vaults the pointed arch appears earlier than the semicircular arch. The entire method of construction indicates for the small resistance to crushing, broadly based structural masses, disproportionately thick walls and frequent terraced forms.

The religious buildings consisted of a massive structure in the form of a stepped pyramidal, tower-like structure erected on a rectangular or square ground plan, that was crowned on the uppermost platform by a magnificently ornamented temple, the sanctuary, and frequently covered by a dome. The platform was reached by stairways leading directly to it or by a continuous ramp, arranged with a gentle inclination spirally around the nucleus of the structure. (Fig. 26). Besides these tower-like buildings sometimes were also found great walled temple courts with altar structures and covered rooms for worship and a monumental gateway as for a fortress, similar to the Egyptian pylons. The palaces consisted of massive towers with several great courts, into which opened the doorways of the surrounding rooms. According to the descriptions of the Grecian and Roman writers, these palaces were not inferior to those of the Egyptians. But from the slight durability of the materials employed, those of the Babylonians existed but for a brief time. The most important that has been brought to light by more recent excavations for the palace of Nebuchadnezzar and the so-called hanging gardens of Semiramis, are glazed wall friezes with finely modeled figures of animals and fabulous beings, whose conventionalization exhibits many traits harmonizing with the Egyptian, yet shows a freer imaginative treatment.

A more complete representation of Assyrian architecture is afforded to us by the remains preserved in the mounds of ruins at Nimrud, Kujundschik (Nineveh) and Khorsabad. They adhere directly to the Babylonian, but here it appears for the warlike as well as splendor-loving people chiefly in the service of the monarch for the glorification of his warlike deeds and his court life. Therefore palace architecture also stands in the foreground. But few remains of temple architecture have been found. But from these as well as from the rep-

representations on the relief slabs it appears, that the ancient Babylonian form of the stepped pyramid, termed ziggurat in Assyria, was likewise determinative here. The palaces also followed the Babylonian model.(Fig. 27). They stood on widely extended terraced substructures, accessibly by double stairways and ramps, enclosed by a parapet wall, and they contained a number of rectangular courts, that each formed an enclosed plan, and with the adjacent rooms permit the recognition of their purposes as the seraglio (monarch's residence), harem (women's dwelling) and khan (buildings for servants and the offices). (Sargon's palace at Khorsabad measures 1128.7 × 1027.0 ft., has 30 courts and 200 covered rooms).

The material is the same as in Babylon; only to a moderate extent are natural stones employed, which were quarried from the nearby mountains of the upper river valley. The use of iron tools was already common in the 8th century. The science of vaulting experienced a considerable further development. The gateways (Fig. 31) were covered by carefully executed round arches; sewers, passages and narrow rooms were spanned by pointed and circular or elliptical tunnel vaults, smaller buildings even by domical vaults.(Fig. 28). The walls were not seldom covered by slabs of limestone and alabaster. As free supports served wooden columns, whose shafts were sometimes sheathed with hammered bronze plates, but some were likewise of stone with plain shafts. In the treatment of the base and capital, the form of a compressed sphere ornamented by circular arches is peculiar to Assyrian architecture.(Fig. 29). Also animal figures and winged forms found employment as the supports of columns, indeed with a symbolic signification. (Fig. 30). On some capitals appear the historically interesting volutes, i.e., sidewise scrolls in spiral or snail form, frequently doubled above each other. The treatment of the wall surfaces is commonly by rounds placed beside each other. As a cornice is found on parapet walls one formed as a cavetto, on the enclosing walls being a continuous series of stepped battlements.(Fig. 31).

Great gifts are exhibited by the Assyrians in ornamentation. The grandest figures are the colossal forms standing as guards at the portals of the royal palaces, treated similarly to the

Egyptian sphynx with bodies of bulls or lions, human heads and wings. (Fig. 31). A portrait likeness is wanting to the heads. The conventionalization characteristic is Assyrian and Babylonian art occurs in the arrangement of the beard and hair. With geometrical and plant motives, most common are network, scrolls and interlaced bands, rosettes, palm leaves, pomegranates, a kind of (pine) cone, and the tree of life. The arrangement of the decoration, in regard to subdivision in panels, bands and enclosing borders, always follows the principles governing the weaving of fabrics and embroidery. Nearly all overlays are polychromatic in bright colors.

It was an extremely rich and highly developed civilization, that flourished on the soil of Mesopotamia. Its products in the art industries were widely extended and also exerted a strong influence upon the art of the West. Its scientific determinations relating to the subdivision of the calendar, of weeks and days, in a numerical system, and even in measures and weights have remained influential until the present time. But already internally completely outlived, it could no longer resist the finally invading Indogermans.

With the fall of the Assyrian world empire also commenced the ruin of Mesopotamia and its flourishing states. Their fortifications were leveled in order to destroy all hope of regaining the ancient independence. Babylon, the capital, enjoyed yet a brief existence. Slowly and permanently the primitive civilization fell. The inhabitants disappeared, the dykes fell down, the canals became filled with mud, and the rivers flowed over the unfortunate land without restraint, and which is for us now merely the wide tomb of such a formerly magnificent Babylonian and Assyrian civilization.

2. Architecture of the Persians.

The political inheritance of the Assyrian world empire fell to the Persians. These formed a branch of the great Indogerman (Aryan) family of races, to which likewise belonged the previously mentioned Vedes and the East Indians. The former dwelt in Iran, the broad elevated plateau between Mesopotamia and the border of India. Their first great monarch was Cyrus,

who subjugated the Medes, the Babylonians, the Assyrians, and the adjacent races and (about 550) founded the mighty Persian empire, that finally extended from the Indus to the Mediterranean, even over Egypt, but to which was assigned a duration of only two hundred years. In the year 330 B. C. it was conquered by Alexander the Great and incorporated in his empire.

The religion of the Persians is based on the theory founded by Zarathustra (Zoroaster in Greek), of an allwise and almighty god Ahuramazda (Ormuzd) as creator and preserver of the world, the god of goodness, of truth and purity, who sought to oppose Angramainjus (Ahriman), the god of darkness, of lies and of evil. In this strife must also each individual man take part, in order after death to enter into the joys of paradise. Herein the deities subordinate to Ahuramazda gave him strong aid, among them particularly that of fire and Mithra, the god of light, to whom therefore was paid especial reverence in the fire worship and the service of Mithra.

The influence of this religion first expressed itself in the tombs, of which both detached structures as well as rock-cut sepulchres have remained to us. True temples were not erected by the Persians. As fire worshipers they required only the altars, that they built on high mountains within a sacred precinct, and on which was kindled the sacred fire. From the political character of the Persian world empire, that comprised so many races with different customs, always taking as a maxim the extension and glorification of the power of the monarchy, the entire art was compelled to take an exclusively courtly stamp, and the erection of royal palaces formed the centre of the entire artistic activity. The most important remains of these are those of Pasargada (near Murghab), Persepolis and Susa.

The tombs are either detached structures in the form of towers or stepped pyramids (tomb of Cyrus near Murghab), or are rock-cut tombs. The latter are simple and without ornament internally, but have on the exterior a complete facade cut in the rock, with the portico architecture peculiar to the Persians. (Tomb of Darius near Nakshhi-Rustam. Fig. 32).

The palaces were placed within an extended and elevated area enclosed by walls, on which the different structures were

chiefly arranged separately as gateways, reception halls and residences. The finest and most perfect example is presented by the great royal palace of Persepolis, that in its essential parts was erected by Darius I and Xerxes I. The buildings have the character of columnar halls with flat roofs, in which a greater emphasis is laid on the columnar architecture, conceived as purely ornamental, than on the palace architecture of any other people. Although the columns are of stone, they exhibit unusually slender proportions, which thereby indicate that they had to support only a light wooden ceiling. They consist of a channeled torus or bell shaped base, a slightly diminished and delicately fluted shaft, sometimes with an intermediate block composed of several parts, and the specific Persian bull or unicorn capital (Fig. 33), on whose top rests the cross beam. On this is laid the triply divided architrave with dentil frieze (tomb of Darius), recalling the facing boards of the preceding wooden architecture, or a richly decorated main cornice in several members and crowned by stepped battlements. (Fig. 35). Doorways, windows and the niches preferably employed to animate the wall surfaces receive a rectangular basal form with a moulded architrave and a high cavetto as a cap (Fig. 34); they give us the earliest examples of an expressed window architecture. The Persians devoted great care to the flights of steps constructed of marble, on which all visible surfaces were decorated by richly sculptured ornaments. Likewise the enclosures of doorways, windows and niches, as well as the plinths, angles of walls and their projections were constructed of marble or limestone, but the walls in the interior were of burned bricks, air-dried bricks or even of tamped clay in masses with a facing of bricks or of stone slabs.

For the architectural development and the entire sculptured and ornamental treatment of the architectural works, ancient Persian art produced only very few new creations. Most forms were borrowed from Mesopotamian and Egyptian art, and that of Asia Minor, as being not otherwise possible by the entire origin and composition of the empire, and in this transfer certainly a freer feeling for princely elegance was active. To

the native fragrance of dignified classicality, that flows about the proud porticos (Fig. 35), these owe to the mighty influence of the architecture of Asia Minor and of Greece, developed at the same time in those western countries.

With the conquest of the Persian empire by Alexander the Great vanished the splendid and luxurious court life of its prodigal monarch and also therewith the entire arts in their service, Grecian civilization and Grecian forms were brought in and were borne into the far East to the banks of the Indus. But since after the collapse of the monarchy of Alexander a new Persian empire arose on the ruins of the old and rose to a high elevation under the Sassanides (226 B.C - 636 A.D.), then the traditional ancient Persian style of architecture was again recalled to life, and from its combination with Grecian elements of form and the Roman-Byzantine science of vaulting resulted the beginnings of that fanciful style of architecture, which was to come into full development in the art of Islam.

3. Architecture in the coast lands of western Asia.

Westward from Mesopotamia, in the extreme Asian domain bordered by the coasts of the Mediterranean Sea, which in its situation, climate and fertility combined so many advantages, already very early were found settlements by Semetic and Aryan races, that in their political conditions as also in their civilization were more or less dependent upon the powerful adjacent kingdoms, but whose art is especially important for us, since it forms a natural connecting member between the art of the ancient East and that of the West. In northern Syria and between the course of the Euphrates extending farthest west and the coast mountains of the Mediterranean Sea, already about 1500 B. C. the mighty race of the Hittites (Hethites) founded a flourishing kingdom with an existence of 800 years, whose language and art exerted a controlling influence over all western Asia. The narrow coast region of Syria between the Lebanon and the Mediterranean Sea was occupied by the Phoenicians, the bold voyagers and industrious merchants of the ancient world, to whom during the first thousand years fell

the sole carrying of the artistic products of the East over the waves of the Mediterranean Sea into the farthest West of northern Africa and southern Europe, and indeed yet farther beyond, founding numerous colonies for aiding and extending their commercial interests and for strengthening their power. Beside them in the little province of Palestine dwelt the Hebrews, who immigrated from Egypt about 1250, that were distinguished above all oriental peoples by their religion, characterized by severe monotheism, when they worshiped but one God and him without an image. In Asia Minor were chiefly found Aryan races as the bearers of a higher civilization, on the southern coast being the sturdy mountaineers, the Lycians, with the Lydians farther northwest of them, a powerful commercial people, that about 550 exercised supremacy over all Asia Minor, and at the northwest of the Propontis (the modern Sea of Marmora) to far in the interior of Asia Minor were the Phrygians, who already early in the third thousand years wandered over the Hellespont from the Balkan peninsula; to those are to be referred the most ancient traces of an advanced architecture in Asia Minor. Also even if all these peoples in the evolution of their civilization were under the sway of the great adjacent kingdoms, yet they developed their architecture again in their own way.

From the Hittites came the great palace and fortress ruins of Sandschirli, Boghaz-Koi and Boghaz-Oyuk, composed of cyclopean walls of massive blocks, of which the gateways were treated either as double towers with a colonnade between them, or even with two standing sphynxes in the Babylonian manner. In the reliefs cut on walls as well as in the rocks, and sometimes of colossal dimensions, is exhibited a native style in the pointed shoes, beardless faces and the tall pointed hats of the human figures, but which was later suppressed by Assyrian and Egyptian influences. On a Hittite relief is represented a sanctuary with two Ionic columns, which have to pass for the oldest known volute form of the Ionic capital.

Among the Phoenicians the centre of artistic activity lay in the practice of the art industries. This rose to a high point in the Phoenician chief cities of Sidon and Tyre. But

of architectural creations meriting consideration on the whole but little was produced. (There are preserved to us a few architectural monuments at Amrith, small isolated temples cut from colossal blocks of stone (Fig. 36) and tower-like tombs, crowned by a dome or a pyramid (Fig. 37) whose treatment indicates the combined influence of Assyrian and Egyptian forms.

35- But in practice the Phoenician workmen were masters in dressing stone, in the handling of great masses, and in the art of working wood. Therefore by the Hebrews, who certainly preserved no native artistic experience and were entirely dependent therein on the Phoenicians, were they called to Jerusalem for the erection of their most important structure, the temple of Solomon. The plan consisted of a great walled temple precinct, the outer forecourt, within which lay the inner forecourt on a raised terrace, which like the external one was enclosed by subordinate structures like porticos. Within the latter rose the real temple house, consisting of a vestibule and an internal temple room, divided by a great portiere into two parts, the "holy" and the "holiest" places. The temple was constructed of stone, lined internally with cedar wood and covered by sheet gold. It was entirely destroyed in 586 by Nebuchadnezzar. -- The Hebrew monuments in the Jordan valley, both the isolated tombs cut from boulders as well as the true rock-cut tombs exhibit a marked crossing of the art tendencies heretofore described with Grecian influences, and they date from the Hellenistic period, so far as they merit artistic consideration.

Among the colonies of Phoenicia the island of Cyprus takes an important place. It was rich in temples of the great goddess Astarte, the Hellenic Aphrodite, who rose from the foam of the sea on its coast, according to the Grecian myth. Here an apparently Aryan race under the charge of the Phoenicians made their own transformation of Egyptian and Assyrian motives and created forms of capitals among other ornamental forms, that may be regarded as prototypes of the later Ionic capital. (Fig. 38).

The tombs of the Lycians in Asia Minor possess great interest for us. They are chiefly rock-cut tombs with facades en-

entirely cut on the rock, that exhibit in the clearest manner the direct transfer of Alpine construction framed in wood with its beam ends, panels and the like.(Fig. 39). Likewise the detached tombs cut from a boulder as a sarcophagus are executed in the same way. The later tomb facades instructively show the change from the purely structural wooden framework to the Grecian columnar architecture.(Fig. 40).

An entirely different series of monuments is met with in Lydia. Here are almost exclusively tombs, indeed in the form of the tumulus entirely foreign to Asian peoples, as a cone of heaped and tamped layers of earth above a circular wall of polygonal stones with plinth and cap (the So-called tomb of 30 Tantalus), and partly of very great dimensions. (The tomb of Alyattes, father of the Lydian king Croesus (died 584 ?) exceeded in perimeter the largest Egyptian pyramids, and it still has now a height of 226.4 ft.). These tumulus tombs contained internally the carefully concealed grave cell covered by corbelling or by voussoirs, to which a special passage sometimes led.

Likewise in Phrygia, especially in the plain of Troy, still exist numerous similar tumuluses. But the rock-cut tombs have greater importance here, particularly those of Ayazinn, whose grave cells partly imitate the interior of a house with benches and all details of roof construction on the scheme of a gable roof. The exteriors of these tombs chiefly exhibit only a doorway placed high in the rock with a kind of heraldic cap, consisting of round pillars with capitals and with lions placed at each side.(Similar to the Lions' Gate at Mycenae represented in Fig. 61). But there is also found another type of richly decorated rock-cut facade with false doors, triangular gable, and a covering of the entire surface by geometrical patterns indeed taken from brick ornamentation.(So-called tomb of Midas). Since the grave cell is lacking in these tombs, they are to be regarded as places of worship or indeed as memorials of the dead. From the Phrygians also came the oldest vestiges of an advanced city architecture in Asia minor, which Schliemann discovered beneath the rubbish mounds of Hissarlik in prehistoric Troy, and which are indeed to be referred to the third thousand years B. C.

All the peoples here mentioned were submerged in the great changes succeeding the contest of the Semites with the victorious invading Indogermans in the first half of the last thousand years before our era, or they were conquered by the national customs of the new rulers, and thus the native character of their art vanished. But their civilized tendency did not disappear in the domains of savage races; it lost itself together with those of the dying oriental world on the lands of the youthful and fresh Aryan races of the West, and from this then sprang that rich and noble climax of civilization, that today exercises supremacy in the art and intellectual life of the entire civilized world.

V. Architecture of Eastern Asia in India, China and Japan.

Aside from the great movement in the history of civilization, that was completed in the West of the Asian part of the world and there entered so deeply into the history of the nations, there was evolved in the kingdoms of middle and eastern Asia, in India, China and the adjacent countries, a civilization extending over vast domains, indeed then already comprising the half of all mankind, but whose course presents an entirely different picture in comparison with that of the West. While the civilization heretofore described is found in a constant stream passing from one people to another, always turning toward the Mediterranean Sea, finally overleaping to the Grecian peninsula, as we shall see later, in order to from thence advance farther over new haves in the West, ever becoming higher and more many-sided, the evolution of the civilization of the East was completed in slow and but slightly interrupted progress on the same soil and on the whole also entirely within the bounds of the same nationality, one-sided, only developed from its own needs, with a rigid adherence to types once formed. Even if the art of this empire in the course of its history adopted so many impulses from western civilization, these were yet so transformed under the influence of the religious opinions and of the character of the people, that the foreign elements are only to be recognized as reminiscences.

The weight of the civilization of eastern Asia lies in India. Here immigrated already in the beginning of the second thousand years B. C. main branch of the great Indo-german family of races, occupied the river valleys of the Indus and the Ganges, and finally the entire peninsula, exerting in time a strong influence over the distant East, on China, Korea, Japan and the adjacent countries. About 508 B. C. the Persian king Darius conquered the northwest part of western India, and in the year 326 Alexander the Great took possession of the entire domain on the right side of the Indus. Thereby the forms of Persian and Grecian stone architecture penetrated into India and there mingled with the national wooden architecture,

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from which proceeded the peculiar and national ancient Indian art style. This was almost exclusively a religious monumental art and was originally based on Brahmanism, the oldest Indian religion, that accepts a divine trinity, Brahma the creator, Vishnu the preserver, and Siva the destroyer, in whose service were innumerable subordinate gods, semigods and demons. In the second half of the 6th century B. C. appeared the great Indian reformer Buddha (the enlightened). He opposed to Brahminism, petrified in externalities, its speculative and power-seeking priesthood and its intolerant caste system, his wise teachings on the duty of self-denial, abstinence and isolation from the world, and thus founded Buddhism, which was then elevated to the state religion in the 3rd century B. C., remaining such until in the 7th century A. D. But this religion never struck deep root in the people. In the 6th century A. D. originated a strong movement in favor of the Brahmin faith, in the course of which the "Neo-Brahmanism" became victorious (7th century). This developed a high art period, until Islam gained entrance in the 12th century, and in combination with the native art style attained to a development of fabulous splendor. Since we shall describe this late Indian (Mohammedan) architecture in another place, there comes into consideration for ancient Indian art only the periods of Buddhism and Brahmanism.

The oldest monuments date from the time of king Asoka. After he was converted to Buddhism (about 250 B. C.), he erected in honor of the divinely revered founder of the religion numerous artistic structures in the forms of memorial columns, topes, cave and grotto temples. Likewise under the sway of Neo-Brahmanism was grotto construction extended in a grand way. But the highest works of Brahmin architecture are formed by the imposing detached temples, that we term pagodas.

The monumental columns (stambhas, lats) were erected in memory of the victory of Buddhism. They are about 39.4 ft. high and have a bell-shaped capital, that supports religious symbols, generally the sacred wheel, or figures of lions and elephants. As actual religious structures served the tobes (stupas). These monuments so characteristic of Indian art have the form of a tumulus completely rounded off, consisting of a

square or round base with a dome resting thereon. They were entirely constructed of stone and contained a small cell in the interior, in which the relics of Buddha were generally preserved. In this case were they preferably named dagopas. The substructure was generally enclosed by a circle of columns or a stone railing with gateways, on which the ancient wooden architectural style with its rich sculpture appears to be directly transferred to stone. (Fig. 41). The cave or grotto structures indeed resulted in consequence of the isolation from the world taught by Buddha, as settlements of Buddhist priests. They are either true sacred temples (chaitya), and then have a ground plan similar to one of the Early Christian basilicas, as a rectangle cut deeply in the hill, when two or more rows of piers or columns were left standing, to obtain an interior in three or more aisles, closed at the rear end by a semicircle for the dagopa or the statue of Buddha; or they are dwellings like monasteries (vihara), when square cells are grouped around a hall with piers or columns. The execution is so complete as if the entire internal architecture and also frequently the facade of a detached and most richly ornamented wooden temple were directly imitated in stone. Even in spite of their depressed form, the columns and their varied composition as prisms and as swelled balusters with console supports for beams appear to be petrified wooden pillars. (Fig. 42). The most important rock-cut temples are those at Karli, Ellora and Elephantas. The latter belong to the creations of Neo-Brahmanism, which undertook there an entirely unusual work, when it not only excavated the rock to form temple interiors, but also detached the entire temple from the rest of the rock and then sculptured on the exterior of the colossal temple thus obtained an external architecture treated in the richest manner, so that finally the temple appears as a detached rock-cut cathedral wrought from a single stone. (Monolithic temple). The Kailasa at Ellora (Fig. 43) affords an excellent specimen of it. But the Neo-Brahmanic and all Indian art reached its climax in those mighty detached temples scattered in great numbers over all India, that are termed vi-manas by the Hindoos, and pagodas by others. Those best known

among them are those of Srirīngam, Madura, Chalabrom and Tanjore. They consist of a square cell, lying behind a three-aisled room as a relic shrine, and before the former are placed one or more porticos. Over the cell rises on a low rectangular substructure the massive square principal tower in the form of a high and many-sided pyramid (in the South), offset inward at each story, as a dome (in the North) outlined by a flat arc. This temple house is enclosed by one or more rectangular courts lying within each other and formed by walls, in which in the larger plans also lie subordinate temples, halls for pilgrims (choultries), colonnades, sacred tanks etc. Likewise the gateways of these courts are crowned by those stepped pyramids or domes, which impart to the entire temple design its peculiar and fanciful general impression. (Fig. 44). Their treatment by architectural members and sculptures is indeed truly marvellous. The formation of the supporting posts as columns, piers (Fig. 45), human and animal figures, and the supported members, the cornice, frieze etc. exhibit an infinite diversity. Vacant spaces are scarcely found on the walls. The entire architecture, in connection with the overflowing ornamentation borrowed from the native flora, fauna and symbolism, presents a wonderful reflection of the luxuriant growth from the Indian soil and of its rich world of thought and imagination. It is the conception of the highest and most amazing of all, that civilization has created in the tropics.

The northern adjacent empire of China also has a very ancient civilization extending back into the third thousand years B. C. This indeed developed in greater isolation, but still in the 2nd century B. C. certain western Asian and Grecian influences, and in the 1st century A.D. strong Indian-Buddhist influences may be recognized. With the predominating tendency toward the practical and useful, toward industrial attainments, of the nation belonging to the Mongolian race of mankind, the chief attention was paid to art industries, in which the Chinese by their technical knowledge and artistic qualities reached a high stage, on which they have even repeatedly supplied valuable models to the West. In architecture they evolved in general a great advance only in engineering

structures, in design of canals, bridges and fortifications. their most important work in that domain is the Chinese wall, already commenced in 246 B. C. and erected for protection against the hordes of northern barbarians, which extends to a length of about 1864 miles over broad river valleys and high mountain ranges (Fig. 46). It is constructed of external and internal walls of about 3.28 ft. in thickness and of stone or brick, filled with rubbish and earth, covered with burnt tiles and crowned by battlements. Its width amounts to 11.5 to 26.3 ft. and its height to 23.0 to 52.5 ft. It was put into defensible condition by stately round-arched gateways, massive projecting square towers and a continuous open platform. It has in great part now fallen down.

Other stone structures of a monumental character to be mentioned in the first line are the triumphal and honorary gateways (pai-lu), which were erected at the command of the emperor or his representative before the gates, on the public squares and in the streets for a permanent memorial of a great event or in honor of especially deserving men. (Fig. 47). The forms employed for these are taken directly from the methods of wooden construction, which dominated the entire Chinese architectural style. The architecture exhibits always the same scheme for all buildings, both for residence and religious purposes; only the terraced and basal substructures and the stairways are of ashlar, but the superstructures are of wood, using brickwork with a plaster coating to fill the panels of the half timber work. Each story appears as a carefully executed wooden framework. As supports are employed round or square posts, (Fig. 48), the latter usually with rounded angles. They stand on a flat disk-like plate extending to the floor with a cove. Capitals are wanting. The beams supporting the ceiling rest upon corbel-like arms or caps projecting from them, that are elastically curved and are carved in the richer treatment, partly in the form of the heads of elephants, dragons etc. The ceilings are horizontal and are divided by wooden bands into small and mostly square panels, whose surfaces receive ornamental decoration. Overlaid ornaments adorn the crossings of the bands. The centre of richer ceilings frequently contains a considerably raised square or pol-

polygonal panels with strongly projecting mouldings arranged in star form. Beneath the ceiling extends a peculiar frieze composed of wooden arms and caps (masugami), that take the place of the console cornice.(Fig. 49). The same form of cornice is again found on the facades as the uppermost termination.(Fig. 53). The effect of the exteriors of Chinese buildings is based on the airy corridors or porticos extending around the ground story, and particularly upon the widely projecting roof (t'ing), that finds employment in abundant measure, even on the honorary and entrance gateways merely composed of posts. It is constructed by means of concave curved timbers, bent upward at the angles, is covered by concave tiles of different colors, and on the underside the purlins, braces and rafters are decorated in the most animated way by all sorts of fanciful carvings. This type occurs in approximately similar combinations on the temples as on the secular buildings.(Fig. 50).

Distinct temples were not erected in the early period. The ancient state religion for two thousand years was devoted to the veneration of heaven, earth and ancestors, and lacked the formation of myths. Therefore it required no temple. Under the open sky, on terraces were offered prayer and offerings. Only after Buddhism had found admission to a greater extent (in the 2nd century A. D.) originated the slender pagoda tower (tha), so characteristic of Chinese architecture, which is composed of a considerable number of quite similarly treated stories, each one furnished with the fancifully curved roof, at whose edges sometimes hang bells.(Fig. 51). They stand on stone substructures, and generally have in the upper stories enclosing galleries composed of wooden columns, and the separate stories are treated just as in secular architecture. In the later period were also erected low and wide hall-like temple structures. They generally received a double roof. The interior contains in the centre of the room a structure like an altar for the divine image of Buddha. At the walls are placed representations of the subordinate gods.(Fig. 52).

In secular architecture the imperial palaces occupy the far most important place. Other residence architecture was too much restricted in its free development by the magisterial

building regulations, according to which a definite and fixed rule for every owner in accordance with his rank, had to be followed, concerning the proportions of the different parts, the number of columns to be employed and the like. The palaces consist of a larger number of structures, that are separately intended for the court, for the servants and the housekeeping. As a rule they were erected in symmetrical arrangement on terraces in several steps, surrounded by luxuriantly moulded and ornamented enclosures of stone. One story porticos connected the buildings intended for the housekeeping. The doorways (Fig. 53) have a rectangular or pointed form, the latter extending but slightly above the semicircular line. At the windows is usually found a very low foiled arch. For the plinth of the building, the architraves and even on particularly accented places were employed clay tiles, plain, ornamented or adorned by sculptured reliefs, which especially harmonized with the low carvings in wood. (Fig. 53). The ornament on the friezes exhibits geometrical forms, particularly zigzag patterns, interlaced bands, frets (Fig. 90, Greek bands), rosettes, repeats, scrolls etc. in a very free play of line, yet always in an animated course. In the panels only the play of waves and bands of clouds are combined in endless repetition, composing lively surfaces of water and cloud forms, in which play and roll the fanciful dragon figures. To heighten the effect all parts of Chinese buildings, so far as the material itself is not treated in color (glazed clay tiles), receives an extremely varied painting, finely graduated to the warm yellow tone of the ground.

Particular skill is shown by the Chinese people in the arrangement of buildings in the landscape. Their gardens are laid out in skilfully conceived irregularity with cascades, light bridges, artificial grottos and ruins, temples, cottages, monuments and picturesque groups of trees, alternating with peaceful meadows etc., and they are the direct prototypes for the style of the "English gardens", that became general in Europe from the middle of the 18th century.

In Japan civilization and art, in regard to national customs, religion and external conditions, on the whole proceeded on similar principles, directly under the strong influence of the

Chinese, so that its architecture essentially has the same characteristics as theirs. But since already the entire country surrounded by the sea its geographical location exhibits so many advantages over China by its mild climate belonging to the temperate zone and by the favorable nature of the soil, thus the Japanese also have in comparison to the racially allied Chinese a higher artistic endowment and an expressed inclination toward a refined and cultivated life for itself, that also appears in a higher conception of artistic problems and an ennobling of the artistic means of expression. Thus the main type, the materials, the methods and the alphabet of forms were then transferred, but were brought in Japan to a higher development and perfection.

The historical tradition of Japan does not extend beyond the 7th century B. C., but only from the end of the 3rd A. D. does it afford authentic statements. At that time the island empire was permanently united under one monarch (mikado). The original religion of the country is based on the Shinto faith, the divine veneration of great world objects, the forces of nature and certain enlightened spirits, and also in the later period of ancestors, without strictly stated dogmas or definite customary commands. About the middle of the 6th century A. D. entered Buddhism, and thenceforth the two religions remained peacefully together, with a varied influence and fusion of the worship peculiar to them. The Shinto temples exhibit a continual evolution from the earliest historical period until the present time, although in accordance with an ancient custom, they are torn down after definite periods, (in the province of Ise after 20 years, in Usa Hachimon after 33, in Izumen sometimes after 30 years), and the principle was established, that they were to be rebuilt as faithful imitations of the old temples. The influence of the Buddhist style of architecture, the changes in the intellectual and religious views produced frequently by time and place, as well as those in artistic design also influenced the artistic transformation of these temples.

The Shinto temples in the earliest period (until the end of the 8th century A. D. comprised a square or rectangular room, either undivided or separated into two cells, the front divi-

division serving as an anteroom to the sanctuary. The covering was a gable roof, leaving free gables on two sides. Around the temple interior extended generally an external corridor at the height of the internal floor, which was accessible by a comparatively high flight of steps.

The dimensions of the interior of the temple vary between 9.8 and 36.0 ft. Great round tree trunks are connected by horizontal timbers and support the roof purlins. Besides the gable rafters crossing at the ridge or special ridge and purlin ornaments, no other decoration exists. In larger plans other structures are grouped around the temple proper, treasuries and guest rooms, granaries, living rooms and the like, without being connected by covered passages. The temple precinct is externally characterized in even simple plans by the torii, the gateways peculiar to Shinto architecture. These consist of vertical round trunks, or those slightly inclined toward each other, with girts and single or double caps at top, whose overhanging ends are slightly curved upward. (Fig. 54 a). Their form is so typical, that even when erected in stone and bronze, as exceptionally occurred for the torii of the Yoya temple at Nikko, it was in nowise changed. The most famous temples of this kind are those at Nikko in the province of Iso. There since the first century of our era has been preserved in costly shrines and revered the sacred mirror, as a symbol of the sun and of light, and likewise a sword, both of divine origin according to the legend; imperial princesses have from ancient times served as priestesses. These temples at Nikko still exhibit the Shinto style in its original purity.

From the change to the 9th century onward Buddhism forms with their curved lines and surfaces intruded into the simple Shinto style of architecture in most of the temple structures. But the corridor is preferably enlarged at the entrance side to a place of prayer (kohai), that is covered by a shed roof. There occurs a further subdivision of the temple interior, yet always so that the sanctuary occupies the most distant and relatively smallest room, in accordance with the Shinto belief, that the sacred mirror should never be exposed to the external world and the gaze of ordinary mortals. The form of

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the roof lost its simplicity; its surfaces became concave. the number of ridge lines was increased. The caps and braces of Buddhist art were adopted. From about the beginning of the 16 th century onward the fusion of Shinto architecture with that of Buddhism -- aside from some exceptions like the Shinto temples at Nikko -- became nearly complete. As the last step may be taken the so-called eight ridge style, an example of which is given in Fig. 54 b, the temple of a hundred corners at Kioto.

In connection with the Shinto temples is yet to be mentioned the No theatres, that are frequently connected with them as well as with the larger palace designs. These consist of a square stage open at its sides, with an adjacent room for the chorus and the musicians. The latter is connected at the rear by a suspension bridge with the waiting and dressing rooms for the actors. The audience room extends around the stage in three rectangular wings. The No stage serves for the presentation of traditional dances, chiefly with a meaning connected with the history of the religion.

With the spread of Buddhism was introduced the Chinese style of architecture with the pagoda towers in several stories exclusively belonging to Buddhist art.(Fig. 55). Thenceforth arose numerous Buddhist temples (tera), that may also be termed monasteries on account of their plans as great groups of buildings. Among them the temple (or monastery) of Horiuji, completed about 600 A. D., presents the most prominent example of the early period. On a rectangular enclosed area accessible through large and impressive torii were erected several structures, among which the one or two story Con-do (main temple, golden hall) and the Ko-do (preaching or prayer hall) occupy the most prominent places. In the immediate vicinity also stand the Ko-ro (drum tower), the Sho-ro (bell tower), both chiefly in two stories, the To, a tower structure in several stories, and the Kairo or Ho-ro, a portico-like gallery or cloister, which connects the main temple, erected about at the centre of the temple plan, with the preaching hall, the bell and drum towers and the pagoda. A memorial capital the (Shakado) in memory of the founder of Buddhism, a library (the Kiozo) containing the sacred writings and a treasury (Ta-

(Taho-to) for receiving the relics and temple treasures complete the inner temple enclosure. A gateway separates this. In the outer circuit about the inner temple precinct are grouped the dwellings of the priests, the bath house and the treasury (Shosoin or Hozo) as fireproof storehouses for precious articles and provisions. Aside from the stone substructures, all these buildings are almost entirely constructed of wood. The supports are round wooden columns diminished in curved outlines, (Fig. 56), on whose tops elastically curved caps or braces intersect as supports of the beams. Thereby the interspace also receives a harmonious outline. The wide projection of the roof rests on inserted lower rafters. The curvature of the roof is produced by several rafters set over each other, the ends of the lower ones forming a continuous and very effective dentil band. (Figs. 54, 55). The internal ceilings are mostly horizontal and are divided into small recessed panels by bands, and which are later decorated by ornamental and figure representations, especially birds and dragons. For richer designs already at an early date (in the 8th century), the walls enclosing the principal room were connected with the horizontal ceiling by cavettos, or the ceiling itself was divided into two surfaces, the central area being strongly raised and passing into the lower surface by a cavetto. The altar generally stands in the interior in the middle between the two main pillars, more rarely next the rear wall. It is composed of a massively appearing substructure, very carefully grouped mouldings, and a very elegant railing above this. The entire execution of the temple construction is excellent. The Japanese are masters in the art of joinery. Their works are characterized by the greatest care in the construction and an unexcelled and loving treatment of the rich ornamental carved work of all details. (Fig. 57). The most important motives in ornament are formed by the cloud band, also occurring in Chinese art, the movement of the waves, forms of plants, flowers and animals, very freely conventionalized. Finally the visible parts receive a warm and harmonious coating of colors, combined with refined taste. This high perfection of Japanese buildings is due to the fact, that at the Japanese nobility took up the practice of art as their

privilege, and the care of art was transmitted from generation to generation.

The best period of Buddhist-Japanese temple architecture falls in the 10th and 11th centuries. In the 16th century the erection of castles (Shiro) and palaces becomes more important, which is chiefly expressed in the grand and skilful lay-out of the general plans, as well as in the splendid equipment of the buildings with sculptures and painting. Likewise here were not arranged a large number of rooms in a single building, but where several halls were to be provided, these were erected in separate structures and combined in groups of buildings, that in great part were connected by porticos. Herein Japanese art shows itself clearly freer than the Chinese. The castle of Nijo in Kioto was completed in the year 1602 and is taken to be the most prominent masterwork of this period.

Its highest triumph and most intimate charm is evolved by Japanese architecture in the "landscape architecture", the fairy-like designs of the parks of great temples and palaces, and even if in lesser proportions, in the extremely harmonious gardens of the separate dwellings. Here appears the innate art tendency of the Japanese in the happiest fusion with their inborn love of nature. By it is also determined the plan of the simple house. As a rule, this is only occupied by one family, and therefore it is small, one story and without cellar, without stairway, attic or fireplace, also being externally almost without architectural treatment; its insignificant side is toward the street. On the three other sides the internal rooms are enclosed by sliding panels instead of permanent walls, and these can be slid apart independently, so that separate rooms may be changed into an open hall, and thus be brought into direct connection with the garden. Likewise the internal division walls are mostly movable, in order according to need, to be able to make changes in the subdivision of the rooms at any time. This house has not its prototype in China, like the Buddhist temple; it is directly originated from the climatic conditions of the country and from the requirements and customs of the people, as a purely national product.

Until the end of the 18 th century continues the advance of Japanese architecture. Thenceforward an endeavor for merely external magnificence with frequently work purely for show, an invasion of meaningless linear curvatures, a certain Barocco tendency, foreign to the nature of the Japanese style, became perceptible; the stage of decadence commenced.

Since the year 1868, the Japanese royal house and its government has striven to strip off the ancient feudal forms, both in political arrangements as well as in architecture, and to transform public architecture in accordance with European models. Thus gradually disappears in the country of the setting sun the characteristics of its ancient civilization and its rich art in so many lines.

VI. Grecian Architecture.

1. General and historical basis.

If after our consideration of the architectural monuments of oriental antiquity, we turn our eyes to the West and enter on Grecian soil, we obtain an entirely different picture, than the scene of ancient oriental civilization and history can present. Not a widely extended river valley, that became for its inhabitants the condition of a monotonous and common life, but a country open on all sides and washed by the sea, which with its **deeply** intersecting bays formed a natural communication for commerce, at first between the numerous islands of Aegean Sea and also thus between all the coastal lands of the oriental and the western world lying around the Mediterranean. To this are added the rich advantages of an unusually favorable natural condition of the country by the rich alternation of boldly rising mountains with fruitful valleys and plains, and a rare diversity in climatic conditions, where the North is adorned by beech forests and exhibits the entire character of the moderate climate, while in the South the palms wave in the midst of fragrant groves of oranges and lemons. In this land we meet with a people sprung from the ancient race of the Aryans, endowed with the intellectual and national advantages of this family of nations, that evolved a wonderful climax of civilization and of art, whose works up to the present time are reckoned the most exalted and the noblest of all, in which the human mind has ever conceived and produced.

The roots of Grecian art are found in that widely advancing civilization developed in the coastal provinces and on the islands of the Aegean Sea, whose remains were discovered to us by H. Schliemann and his coworkers in the rubbish heaps of Hissarlik, Mycenae, Tyrins, Cnossos and at other places. This so-called Mycenaean civilization comprises the pre-grecian stone and bronze periods; in age, importance and extent, it is not inferior to the Chaldean and Egyptian. Its best period falls in the time from 1900 to about 1200 B. C., according to dateable finds, and particularly to conclude from introduced Egyptian products. As its supporters are to be regarded the Achaians, who settled on the eastern coasts of Greece as far as Crete. The Greeks later named them Pelasgians and des-

designated by this name all peoples located in Greece in the prehistoric period.

The Greeks assumed Thessaly as the true native land of their race. There was found a chief seat of Mycenaean civilization celebrated in legends; there had the Aeolians*their home, one of the three chief races of the Grecian people. The two others were the Dorians and the Ionians. The former dwelt in the prehistoric period in the province of Doris in the heart of Greece. The Ionians had settled farther south in Attica, on the isthmus and on the northern coast of the Peloponessus.

Note. The Aeolians probably did not form a race of special character like the two others; the Greeks designated all as Aeolians, who were not of Doric or of Ionic race.

About the end of the second thousand years B. C., there occurred in connection with the first severe contest of the Hellenic races with the Aryan peoples, those great movements and racial displacements, that gave to Hellenic civilization its permanent basis. The Aeolians took possession of the northern part of the western coasts of Asia Minor and the island of Lesbos; the Ionians settled on the middle portion of these coasts and the opposite islands of the Aegean Sea; but the Dorians penetrated southward, conquered and occupied the Peloponessus, the southern islands of the Aegean Sea and the southernmost portion of the western coasts of Asia Minor. Some centuries later, they extended their domains by great activity in colonization over the western provinces about the Mediterranean Sea, especially repressing the Phoenician naval supremacy, and they founded in Sicily and in lower Italy a strongly flourishing colony of Magna Grecia.

Of the three races, the Dorians and the Ionians exerted a predominating influence upon the civilization and art of Greece. Extremely unlike were they in regard to their natural talents:- The Dorians with manly strength, heavy, earnest and dignified, but also brave and temperate, on the contrary the Ionians with warmer feeling, a mobile imagination and an extremely high intellectual endowment, but also with a certain tendency to live well, which reduced actual powers and had as a result mistrust, envy and jealousy toward great men risen from the people. But in spite of this diversity, after they

had obtained permanent habitations and had attained to orderly government and commonweal, the Dorians in Sparta and the Ionians in Athens, the Greeks felt themselves to be one race, and this unity was carefully maintained and strengthened by the common festivals in Olympia, Delphi and other places, recurring at regular intervals. Thus also in the first half of the 5th century they survived that mighty test of strength, in which the little nation of the Greeks overthrew an overpowering enemy invading them from Asia, the Persians, after a famous war, and thus retained their national independence. Thereby Greece entered on its best period. It was unfortunately of but comparatively brief duration. The splendid rise of Athens as the centre of political power and to the elevation of sciences and of arts aroused the envy of Sparta, and thus originated that unblessed contest of the individual states for supremacy (hegemony), in which Greece presents a picture of the most wretched disruption. In this war of brothers the Greeks squandered their best powers, until they yielded almost defenceless to the Macedonian conqueror (in the battle of Cheronea in 338) and lost their freedom forever. Then fell into decadence the national individuality and the purity of Grecian life and of Grecian art. The later culture developed by the new masters already manifests a transition to new conceptions and new forms. In the year 168 the kingdom of Macedonia was subjugated by the Romans and Corinth was destroyed in 146 B. C. Greece had become a Roman province. Thus ended its political history. But in the realm of thought and of beauty, the Greeks now entered into their supremacy over the world.

In the entire Greek civilization, the representation of the gods plays the most important part. The ruler of heaven is Zeus, "father of gods and of men". With his spouse Hera he is enthroned on Olympus at the head of twelve gods, to each of which is assigned a particular field of activity. His brother Poseidon bears sway over the sea and the waters. Hades is over the underworld, the realm of shades. Under these act numberless deities, that are busied in all nature and all phenomena, indeed even in the entire domain of thought. The gods

are like men in body and spirit; they personify the conception of the highest ideal of the most beautiful and most perfect existence, but also share with men their misfortunes. They stand in the closest relation to men, and from this intercourse proceed demigods (heroes), whose fates fill the rich contents of the world of Grecian myths, made immortal by Homer and Hesiod in their songs. The chief gods show men their fortune in the oracles. To them magnificent temples were erected for dwellings, for the display of the image of the god, and as treasuries for the precious articles offered to them.

Grecian temples were consecrated gifts of the nation, of the different races, of the cities or rulers to the gods. In temple architecture the Grecian art spirit first found expression, and the diversity of the artistic conception of the three principal races; all Grecian architecture matured in them.

We divide its development into the following periods.

I. The Mythical or prehellenic (Mycenaean) period (until 1104).

II. The archaic period from the Doric migration until the defeat of the Persians and the hegemony of Athens (1104 - 476), or more accurately assumed, from the beginning of the Olympiads, from 776 to 476.

III. The best period from the beginning of the hegemony of Athens to the occurrence of the Macedonian supremacy. (476 - 338).

IV. The Alexandrine or Hellenistic period until the subjugation of Greece by the Romans. (338 - 146 B. C.).

2. Prehellenic (Mycenaean) architecture.

The earliest vestiges of an advanced Mycenaean architecture were found by Schliemann beneath the rubbish heaps of Hissarlik on the site of ancient Troy, located in the northwest part of the peninsula of Asia Minor and on the Hellespont. Here were uncovered the ruins of several cities, that successively stood on the same place, and which were named the first, the second etc., from the layers above each other.

The earliest plan dates from the ancient Phrygians, who are assumed to have migrated in the third thousand years B. C.

from the Balkan peninsula across the Hellespont into the province of Troy. The second layer is that of prehistoric Troy. With the ruins of Tyrins, Mycenae, Cnossos, Phaestos and Argos, this forms one of the most important locations of finds for the development of prehellenic art. Prehistoric Troy is a city plan executed on the comparatively small area of about 19.4 acres, surrounded by an enclosing wall with tower-like strengthening piers, erected as an irregular polygon. This wall was strongly battering in its lower part and there consisted of quarried stones with a facing of carefully jointed masonry, but in the upper portion of airdried bricks with inserted timbers, both lengthwise and crosswise, as well as angle posts, with clay or river mud as mortar, and a thickness of 11.5 to 13.1 ft. Of the houses erected within the citadel, a group accessible through an inner gateway already exhibits the typical principles of the later typical Grecian dwelling. The dwellings of the men and of the women are beside each other in separate buildings, the women's house consisting of an open vestibule with two relatively small rooms lying behind each other, but the men's dwelling is composed of a deep structure formed by the projecting side walls, an open vestibule in front, behind being the single large room about 32.6 ft. wide and 49.2 ft. deep with the hearth in the middle, the megaron or men's hall. (Fig. 58). The construction is the same as on the external city wall; the ceilings were formed of round wooden beams coated with clay; they are not yet supported by columns. This second layer appears to extend back into even the third thousand years.

The succeeding remains up to the sixth layer appear as gradual extensions of the original city plan in progressive construction from the late stone period until the matured bronze civilization. To the latter belongs the sixth layer, which corresponds to the Troy described in the Homeric poem. It already comprises an area of about 50 acres with an enclosing wall about 16.4 ft. thick and carefully constructed of courses of regularly wrought stones with rectangular cross sections. Likewise on the houses is found an equally solid stone construction. The form of ground plan is yet the same

as that of the prehistoric Troy of the second layer.

A vast advance beyond this plan is found in the city of Tyrins, the racial seat of the Heraclides, belonging to about the middle of the second thousand years. This forms one of the most magnificent royal capitals of the prehomeric period and a chief work of Mycenaean civilization. The city lies on a rocky reef about 984.3 ft. long and 328.1 ft. wide, rising from the Argolic plain, and it is divided into the lower city for the garrison and servants, and the upper citadel with the palace. The enclosing walls of the upper city are still well preserved and have an average thickness of 19.1 ft. They are built of massive blocks of stone and contain passages like galleries and doorways to the adjacent rooms (c in Fig. 60), indeed utilized as storerooms. Their covering is formed by corbelled stone courses, ending in a triangle (Fig. 59). To the palace plan proper (Fig. 60), leads a long passage extending within the line of the walls and closed by a gateway, by which one passes to the great outer gateway structure H (Propyleion) and then into the spacious forecourt F. From thence one enters through a smaller gateway K into the inner court L of the royal palace, that is surrounded by porticos on three sides, and contains on the right of the entrance and opposite the palace the altar A with the sacrificial pit. The house of the monarch (men's dwelling, *Andronitis*) itself consists of an open vestibule (*Aithusa*) with two columns, the transverse room behind this (*Prodromos*) and the men's hall (*Megaron*) with a round hearth at the centre and four wooden columns, that support the ceiling. Over the hearth was probably a square opening in the ceiling for the admission of light and the escape of smoke, or openings were left at the edges of the ceiling between the beams. A narrow passage extends around the men's dwelling, and a similar one about the women's dwelling lying on the court N. This was of similar form but was smaller and accessible with more difficulty. Among the numerous subordinate rooms was also found located near the men's hall a bathroom with a clay bath tub. Likewise care was taken for storerooms and housekeeping rooms, as well as work rooms for stonecutters, potters, goldsmiths etc.

The palace plan of the citadel of Mycenae exhibits the same types of buildings as in Tyrins. The main gateway of the enclosing wall is 9.4 ft. wide and is adorned by the famous relief of the lions.(Fig. 81).

Of high importance to our knowledge of prehellenic art are further the results of the more recent excavations on Crete, in the kingdom of the mythical king Minos. This island farthest south in the Aegean Sea already in the prehistoric period was the centre of a high civilization, that extended over the entire Aegean archipelago, and whose offshoots in certain products may even be found in Egypt and Spain. The earliest Cretan buildings date from the third thousand years and strikingly have rounded circular or oval forms. They are constructed of uncut stones without mortar and are frequently divided into several chambers. Likewise on the mainland were found such detached round structures. They are the direct precursors of the round domed tombs commonly occurring there. Transitional stages to the succeeding epoch have not yet been discovered.

After 2000 the houses have rectangular plans. Of the royal buildings, the extensive "palace of Minos" at Cnossos and that somewhat smaller at Phaestos have been uncovered for the most part. Their plans substantially differ from those of the mainland. As we have already seen, the latter are separate structures with a unified and strictly isolated arrangement, in all probability always of one story, accessible with difficulty and enclosed by a solid defensive wall. But on Crete the architectural style is one entirely open, with numerous rooms extending into each other and connected by passages, several stories above each other (four in Cnossos, required by the sloping site) and carefully constructed stairways. The extensive and complex structure is not enclosed by a wall for defense or protection. We see herein a proof of the security enjoyed by the Cretan monarchs. The arrangement of the rooms follows no definite rule. Great halls do not exist. The best apartments appear to be rectangular and of moderate size, accessible on two or three sides through porticos with piers, outside which are placed open columnar porticos. The piers

are built of rectangular ashlar cut with sharp edges and accurately set on each other, leaving between them free access to the different rooms. Particular interest to the history of architecture is presented by the columnar construction first occurring here in western architecture. The evolution of this is to be attributed to Cretan art alone, since the column employed by it exhibits a form treatment entirely different from the Egyptian column derived from plant forms. The Cretan columns have a capital composed of a large torus with scotia and lower moulding, a shaft strongly diminished downward and a low plinth as a base. This is of stone and frequently the capital also. But the shaft was originally of wood and also retains in its later change into stone the characteristic diminution downward.(Fig. 62). This is explained by the direct setting of the wooden trunk, so that the greater sectional area is next the load to be borne (like the case today with our table legs). On the capital rested a square cap or even directly the architrave beam, on which were placed the round beam ends of the ceiling.(Also see the column in the relief of the lions in Fig. 61). The architectural style is similar to that of the mainland; the substructure consists of ashlar and the superstructure of rubble masonry with inserted timbers and brick walls. The wall surfaces are plastered and generally painted; likewise the floors, that are of plaster, and frequently have bands of stone slabs. Well built winding stairways of stone connected the stories. The wooden columns, the ceilings and wall friezes are partially covered with bronze or gold leaf. The architraves of the doorways are of limestone, and the plinth of the external walls is covered by gypsum slabs.

About the middle of the second thousand years B. C., the columnar construction of Crete had also found entrance to the mainland. Both in the porticos of the gateways, that were arranged at both sides of the strong wall containing the entrance, as well as in the porticos of the royal palace, now of great dimensions, and in the men's hall (see H and K, also M in Fig. 60), columns were employed to support the ceiling. Their treatment in general is the same as on Crete.(Fig. 63).

We have already mentioned the plan of the citadel of Tyrins (page 55), typical of the palace architecture of this period on the mainland.

The Cretan royal palaces were on the whole richer and more magnificent, than those erected on the mainland. But the latter excel them in the isolation of the plan and the clear arrangement of the royal palace, and as we shall see later, this was of importance as a prototype of classical Grecian art. The architectural style of the mainland also later reacted on Crete. The differences disappeared. Notable are the increasing pretensions of the Mycenaean monarchs and the advances of the builders in technical attainments. The palaces of the late period of Mycenae have excellent sewers; the ashlar work was treated with great certainty. From the wall of the citadel at Argos * has remained to us Cyclopean masonry, composed of massive, irregular stones, carefully wrought on joints and faces. (Fig. 64), frequently leveled by horizontal beds, which are also treated regularly at the angles and ends, a mode of construction, that extends down deep into the historical period. * *

* *The Greeks ascribed to the Cyclops the construction of the walls of colossal stones dating from the heroic period, on account of the mythical race of giants, hence the name.*

* * *In the Hellenic period the Lesbians were known for their skill in transferring by a pattern in lead the angle of a polygon to another stone to be fitted. This procedure in construction is mentioned as the "Lesbian canon".*

5. Of particular importance for the architecture of the Mycenaean epoch are the tomb structures. The oldest form of tomb in Crete as on the mainland was the cell or chamber, cut in the rock or built of masonry. The royal tombs of Cnossos consisted of several rectangular chambers, vaulted in the manner represented in Fig. 59. But in Mycenae in the second thousand years originated those great domed tombs, which by their monumental treatment represent a new architectural type, of similar importance as the Egyptian pyramids and the tumulus tombs of the Lydians. They are preserved in great numbers as subterranean domed circular structures with walled access (dromos), entrance doorways, and in the larger designs with also a sep-

separate small tomb chamber in addition to the principal room. The best known example is presented by the great domed tomb of Mycenae, formerly erroneously termed the "treasury of Atr-eus", with a clear lower diameter of 47.9 ft. and a height of 43.6 ft., vaulted in the form of a pointed arch with horizontal courses of masonry diminishing upward and with projecting angles cut off. (Fig. 68). In these domed tombs were not only found fragments of columns (Fig. 63), but likewise utensils, arms and ornaments with rich decoration, on which are frequently expressed reminiscences of oriental civilization and influences of the native highly developed metal work. (In the frequently employed wire spirals and rows of rosettes). The treatment of the animal figures and the face masks masterfully wrought in gold plate exhibit an extremely assured perception of nature.

The climax of Mycenaean art is to be placed at about the middle of the second thousand years B. C. With it also indeed coincides the era of magnificence of that elevated heroic age, of which an unexcelled and living general picture is given to us by Homer in his poems, whose charming descriptions of the former citadels and royal palaces have been substantially justified by the excavations.

3. Classical Grecian architecture.

A. Temple architecture.

I. General arrangement and system of construction.

In the Mycenaean period the architecture of citadels and of palaces stood in the foreground of artistic activity. Temples were still unknown. Offerings to the gods were made in the open air on altars, erected in the middle of an enclosed and consecrated area. Only after the Olympic gods had received human forms in the heroic poems, and were worshiped as statues, appeared the necessity for also building for them suitable dwellings. The direct prototype therefor was found in the ancient Grecian royal palace, whose arrangement of the interior determined the arrangement of the ground plan of the temple. (See Fig. 58). So this also received a portico open in front and with a colonnade. The megasaron became the cell, the living room of the deity. The passage existing in the plan

of the palace of Tyrins around the men's apartment finally developed into the enclosing open portico. By a stepped substructure was the temple elevated above the earth and thereby characterized as the house of the deity. The altar for offerings remained in the consecrated precinct (temenos, peribolos). To this usually led a special gateway (propyleion). Thereby was attained the typical ground scheme for the Grecian temple. But with it was also transferred the entire procedure of the ancient native style of architecture; the walls of half timber work with air-dried bricks or rubble, the wooden columns, the horizontal ceiling of trunks with a coating of clay; only gradually did it attain to an ideal corresponding to the dignity of the deity, an evolution brought to the highest perfection. The Greeks recognized in temple architecture their highest problem; in it matured the entire Hellenic style of architecture.

In the course of the 7th century the Grecian temple attained that perfected form, in which the earliest monuments have been preserved to us, thanks to the durable stone finally employed as the material. From the preceding stages of development many important finds have been brought to light in the most recent period, which in connection with the writings in antiquity afford a partial view of the different intermediate steps. Accordingly there were originally temples, that were entirely built of wood after the example of the framed houses in design, and further those with wooden columns, and again others, on which the wooden timbers were covered with terra cotta (burned clay). About the end of the 7th century was attained the developed stone construction. Since a model for the Grecian temple nowhere occurs among the civilized nations of the ancient world, it appears as the absolutely original creation of Grecian intellect. The artistic centre is formed by the columns (styloi), carried to perfection of form. Surrounded by columns and supported by columns, the house of the god stood in its enclosed sacred precinct, as the most dignified and exalted offering of the Hellenes to the Olympian deities.

The simplest form of plan, the ante temple (templum in antis), enclosed the rectangular interior of the temple (naos, cell)

for the reception of the statue of the deity, and the portico (pronaos) with two columns on the facade (Fig. 66 a) between the side walls (antes, parastades) extended beyond the front wall of the cell. By the arrangement of such a portico at the rear end also (rear portico, opisthodomos, posticum) originated the double ante temple. If columns stood in place of the antes, thus occupying the entire breadth of the facade, the temple was termed prostyle, or amphiprostyle with the same arrangement at the rear end also. (Fig. 66 b). A particularly rich development was imparted to the temple by a colonnade extending around it (peristyle). If a passage formed by a single row of columns (pteron, wing) extended around the cell, the temple was then named peripteral (Fig. 66 c), or dipteral if with a double row of columns. If the cell walls were attached to the row of columns, so that these only formed half columns, this originated the pseudoperipteral temple. (See Figs. 139, 140, 166). If the inner row of columns in the dipteral temple was omitted, so that the passage became twice as wide, the temple was then termed pseudodipteral. By monopteral is understood a round temple of circular form (rare among the Greeks but common among the Romans), which may again be characterized as periptera, (See P. H. in Fig. 96), dipteral etc.

Likewise according to the number of columns on the facade was the temple particularly designated as tetrastyle, hexastyle, octastyle or decastyle, i.e., with four, six, eight or ten columns. For the number of columns at the side of the peripteral temple appears as a rule a ratio to the facade columns of 6 : 13 or of 8 : 17, the angle columns being reckoned each time; yet this was not invariably retained (the temple on Egina had 6 : 12 columns, the temple of Poseidon in Paestum 6 : 14, the Heraion in Olympia 6 : 15, and the temple of Zeus in Akragas 7 : 14). In the more important temples the cell received two rows of smaller columns for the support of the internal ceiling. Thereby the temple interior appears divided into a middle and two side aisles. (Fig. 67 a). The arrangement of a colonnade in the middle of the cell is rare. (So-called basilica at Paestum).

In regard to the period of development of the forms of the plan, the fact deserves consideration, that all large temples remaining to us in Greece, as well as in Asia Minor and Sicily, exhibit the peripteral plan, from which it proceeds, that this most perfect form of the temple was already common in the early period.

The exterior of the temple (Fig. 68) commences with a bold terraced substructure (crepidoma, stereobate), which is chiefly divided into three or often more steps with a height of "more than a human stride". For the entrance is usually on the facade a flight of ordinary steps, either cut for the entire width or placed before 1 to 3 intercolumniations. From the upper surface (stylobate, support of columns) rise the columns and the cell walls.

As free supports the columns receive the load of the entablature and roof and transfer this to the solid substructure. Thus they resist the pressure acting from above, a requirement by which their entire form treatment is determined. By this structural idea taken as the basis of the column is produced a spirited and esthetic impression. It was therefore first necessary to strengthen and enlarge them comparatively at both ends, at which they received the load and also where they passed this to the substructure. Thus originated the head of the column, its capital and the base or foot of the column. (63 The base is wanting for the Doric order. Fig. 69). But the shaft of the column also receives a form derived from its static function. Since the load supported by it increased downward with the weight of the column itself, its cross section is enlarged toward the base, the shaft thus being diminished upward; it thereby produces not only a feeling of assured stability, but also that of a certain ease, with which it opposes the load of the entablature. (Fig. 69). But this diminution does not follow a rigid straight line, but an elastic line slightly curved outward. and that exhibits the greatest curvature at the places, where the column, if it consisted of a flexible material, would bend under an overpowering pressure. The shaft of the column thus receives a slight enlargement (entasis). In order to more strongly emphasize the upward

resistance, the shaft does not retain its unimpressive round form, but it is animated by flutes (channels, rhabdosis) rising vertically, between which are left sharp edges or fillets. (flats). Thereby is not only the eye led upward and thus in the direction of the forces, but the shaft of the column also seems a composite of firmly connected bands stiffly stretched between base and capital, as the strong bearing ribs of a condensing mass. Thus the column with its base and capital presents the visible representation of a perfected support, that can neither be pressed into the ground nor forced into the entablature, and which also indicates in the shaft the elastic and active force, by which the weight of the load is indeed received, but is borne with great security.

Besides the columns appear further the antes and cell walls as bearing structural parts. Therefore they likewise receive base and cap members, the antes as front piers terminating the walls having a flat moulded base, a similar capital and generally plain shafts with the thickness of the lower diameter of the column, the wall having one or two but slightly projecting plinth slabs and a crowning band as the upper termination. In certain cases are the cell walls and antes also diminished like the columns. An opening in the cell walls occurs only by the great entrance doorway extending nearly to the ceiling of the interior, which exhibits an architectural enclosure and cap. (Fig. 102). The doors themselves were of bronze, often entirely or partially gilded. (Windows in Grecian temples occur only on the Erectheion. They have architraves like the doorways but no crowning caps). Through the latticed transom of the doorway also occurred the lighting of the interior. Under the bright light of the south this sufficed for the worship of the deity, for which a dazzling light was unsuited, also the more since the temple was orientated, i.e., extended from west to east with the entrance end toward the sunrise. The earlier assumption that most large temples contained a light court left open in the ceiling of the cell no longer passes as sufficient; in any case such "hypæthral temples" formed rare exceptions.

The columns together supported the external stone entablature.

entablature. This is composed of three parts, the unbroken architrave (thrinakos, epistyle, under beam) extending above the capitals, the richly decorated frieze (zoophoros, sculpture bearer) and the widely projecting main or crowning cornice (geison, corona). The uppermost member of the latter is the cyma or crown moulding in which the water from the roof is collected and led to the ground through the waterspouts, mostly shaped like the heads of lions. (Fig. 75).

The roof is treated as an inclined gable roof rising from the cymas of the two longer sides with the low inclination of $1/7$ to $1/8$ the width of the temple, with pediments at the front and rear. It was constructed with wooden rafters, on which were laid large flat tiles (imprices), that were originally of terra cotta, but later in the richer development were made of marble in the same form. (Fig. 70). The side joints were covered by concave tiles (calypteres), the rows of which terminated at the ridge in ridge tiles of special form, and ended below at the cyma in antefixas. Ridge tiles and antefixas were ornamented by vertical palm leaves (antefixas).

The pediment (aetos) formed at the front and rear by the inclination of the roof was developed into the chief portion of the external architecture. The geison rises to its apex, inclined like the rafters and at the same time terminating the roof on the facades. Great gable and end ornaments (acroterias) stand on bases (plinths) and accent the main points of the pediment. (Fig. 71). Likewise vases, animal and human forms occur at these places. (Fig. 70). In the recessed surface (tympanum) of the pediment the richest and most carefully conceived and treated statuary ornamentation finds its place.

The connection of the colonnade and stone entablature with the temple cell is made by the portico ceiling, the upper enclosure of the external portico. (Fig. 72). It consists of stone slabs with recessed intermediate panels (coffers, cassions) with a broad framework of stone beams, that rest on the architrave and the cell wall, and whose intervals are covered by ceiling slabs with coffers (calymmatias) or by perforated slabs (stroterae). In the latter case the different openings are closed by small stone slabs, that generally received a

painted star. The side surfaces around the coffers are enclosed by decorative mouldings.

No remains of the ceiling of the cell over the interior of the temple have been found. From the stories of numerous burnings of temples, the descriptions of the late Greek authors, as well as from the impossibility of spanning the middle aisle of the larger plans with stone beams, we may conclude with certainty, that these ceilings were constructed of wood with divisions into panels like coffers, which were adorned by colored terra cottas, gilded metal coverings, mosaic (inlaid) work and painting. For the floor were at first employed slabs of ordinary stone, then marble slabs, and finally mosaic pavements composed of polychrome stone bars in ornamental and figure designs.

As the material was generally selected crude marly limestone (poros) in the first period, but later usually marble. The construction was excellent. To secure an absolutely clean jointing of the ashlar and architectural members, they were finished on the abutting surfaces with a carefully smoothed contact margin, being sunken between these, and firmly connected together by iron dowells and cramps without mortar. For shafts of columns, if not made of a single block (monolithic), they were composed of several layers (drums), the flutes being cut at first only on the lowest and highest drums. The drums were then set with wooden dowells in their axes, and the flutes on the shaft were executed later.

Thus the Grecian temple appears to us in its perfection as a well conceived organism, brought to the ideal personification of an elevated idea, in everything worthy of the deity, for whom it was to be a dwelling.

66 II. The Architectural styles. Columnar orders.

For the artistic expression, the architectural form treatment, three different conceptions originated from the Grecian spirit, three varied styles, that came in their basal evolution from the three great Grecian races, the Dorians, Ionians and Aeolians, so that Doric, Ionic and Aeolic architectural styles are to be distinguished. The latter appears to have passed into the others in the 5th century. On the other hand, a new style form appears at that time, the Corinthian.

The native country of the Doric style is the Peloponessus. From thence it already extended very early into the Greek colonies, and just in them, especially in Sicily and lower Italy, have more memorials of its original form remained, than in the mother country. The time to which these creations extend back, may only be given in general outlines. It is to be assumed as certain, that the Doric style was derived from the wooden structural style, that even at about the end of the 7th century were built temples, on which are found no expressly Doric forms, and that only in the course of the 6th century did the Doric style of architecture free itself from the effects of the wooden architectural style and ancient oriental influences, receiving a treatment solely and alone based on stone as its most primitive material. In the entire evolution from the first monuments to the later and matured buildings, there appears a progressive transition from heavy, massive and weighty forms to a lighter and elegant treatment.

57 The Doric column (Fig. 69) from the first does not require a base for its stumpy form, strongly enlarged downward. Its shaft stands directly on the stylobate and is not exactly vertical, but has a scarcely perceptible inclination toward the cell wall.* It has a height of 4 to 6 lower diameters and is channeled by 16 to 20 (20 as a rule) flutes of flattened circular or elliptical cross section, that intersect in sharp edges. At its upper end is formed the necking(hypotrachelion) by a deep annular incision (there are frequently three), which in the earliest period (Fig. 72) has a scotia decorated by a series of leaves (an imitation of the hollow on the Mycenaean capital), later with several annulets (annuli) surrounding the shaft, and passing into the capital (Fig. 74. This consists of an annular round, the echinus, strongly receding below and slightly above, whose section is characteristic for the general effect of the temple, and yields very important evidence for the period of its erection(compare the illustrations previously mentioned), and the square cap (abacus). The ante piers are mostly without bases and have a very slightly projecting necking decorated by a palm leaf band and a but slightly projecting capital with an echinus having the section

of the overhanging moulding (cyma). In the entablature (Fig. 75) the vertical movement introduced by the columns is at first interrupted by the plain undivided architrave, only crowned by a narrow band (taenia) as a neck-band, but on the contrary, it is again resumed in the frieze, subdivided and thoughtfully transposed in the horizontal structural member. The ends of the internal cross beams resting on the architrave project a little, and the visible surface has two vertical channels with chamfers at the sides, which by the form recalling scalloping refer to wooden construction. They have received the name of triglyphs (three grooves). The apparently square intermediate panels (metopes) are closed by stone slabs with ornament in relief or painted. On the architrave the triglyph motive ends below in the so-called regula and drops, a narrow band hanging from the taenia with six drops (guttae). The triglyphs lie on the axes of the columns and over the middles of the spaces between them (intercolumniations). Yet conversely the setting of the columns is again influenced by them, particularly at the angles. If the outermost triglyph were also placed on the axis of the column, a half metope would be produced, an arrangement later common among the Romans and in the Renaissance (See Fig. 127). But the Greeks either set the triglyphs at the outer angle, which gave a greater width to the angle metope (See Fig. 75), or they gave uniform dimensions to the triglyphs and metopes, setting the columns accordingly, which moved the angle columns back to correspond. Likewise above on the geison, the triglyph motive is continued in the mutules (viae) indicating the undersides of the rafters, the slabs slightly projecting from the inclined under surface of the geison, each with six cylindrical or conical drops. In these fully reappears the vertical force effect and movement introduced by the columns. These mutules naturally are wanting (in Grecian art) on the inclined pediment cornice; but on the contrary the cyma bordering the roof is also retained there as a crowning member.

* Whether this slight convergence of the axes of the columns, which only appears on Doric temples, was arranged for static, esthetic or other reasons, has not yet been proved with certainty.

The ratio of the height of the column to its lower diameter substantially determines the basis of the form treatment and the general character of the temple, but it varies much in different examples, as shown by the Table on page 75. On the other hand the other dimensions chiefly remain within certain quite simple numerical proportions that usually recur, both in the arrangement of the ground plan and in the members, so that a constant similarity of the different parts is preserved, and the entire building appears as an animated organism most carefully considered and finished in the smallest details. Thus the Doric style in its severe subordination of every architectural member to the whole presents a perfected representation of the Doric state, in which the individuality of the person wholly merges in the entirety.

At the same time, when the Dorians in the Peloponessus and in their colonies brought Doric architecture into full development and perfection, the Ionians in Asia Minor developed their own architectural style, named after them the Ionic style. With the animated traffic of the Ionians with the European nations direct influences of oriental art appeared among them, which found expression chiefly in the formation of a separate base from the stone support of the wooden column, appearing directly in the earliest Cypriote buildings, and further in the adoption of the volute (scroll, spiral) forms in the capital, already found among the ancient Hittites and Assyrians, as well as in the greater flexibility and lightness of the entire structural system. From the beginning stage of the evolution have remained to us only a few fragments, besides the rock-cut facades of the tombs in Lydia and Caria, which still exhibit the Ionic type of base and capital in a very clumsy manner. Transferred to Attic soil, the Ionic style attained its noblest development, but also with a peculiar treatment of certain architectural members. In comparison with the Doric order the following changes occur.

The Ionic column (Fig. 76) commences with a base composed of several members. (Fig. 77). In the Asian form (B) these consist of a square (rarely polygonal) base (plinth), a high annular concave moulding (trochilus) with encircling rounds, and

a horizontally fluted round (torus). The Attic Ionic form (A) has a lower large torus, a hollow (trochilus) and a smaller torus of less projection without a plinth. The latter form was determinative for the entire architecture of the succeeding times. The shaft is more slender than the Doric (height = 8 to 10 lower diameters), less diminished, has a very slight entasis, and is channeled by 24 flutes of semicircular section and ending in semicircles, between which narrow bands (fillets) remain; it stands accurately vertical. The transition from base to shaft is formed by a reduction like a cove (anlauf at bottom, ablauf at top), with a similar enlargement from shaft to capital. The capital in its simplest form is composed of a bold volute member, curved in elastic outlines, showing at the middle the greatest flexure upwards. (Fig. 78). For the richer form (Fig. 81) the volute member rests on an enlargement of the shaft like an echinus, decorated in relief by a pearl bead as a neck moulding (astragal) and an egg-and-dart moulding; it bends downward at the middle, as if it were composed of a soft material like a bolster. A lower abacus, decorated by eggs-and-darts or a cyma and leaves, completes the capital. In details in the Attic Ionic style of architecture are found varied treatments, the most perfect being on the Erechtheion.. (Fig. 80). The spirals were drawn free hand and without the assistance of compasses.

By the adoption of the volute bolster in the Ionic capital, this acquired a side elevation entirely different from that of the front or back. Consequently its use on peripteral buildings, particularly on angle columns, presented important difficulties. Men sought to overcome these by making special angle capitals, on which the side was treated like the front, whereby the volutes meeting at the angle formed a scroll strongly bent outwards. (Fig. 83). In order to free the Ionic column from every limitation in its use, the so-called diagonal capital was finally constructed, showing the same elevation on all four sides, with volutes curved outward at the diagonals of the abacus. (Fig. 79). This capital already occurs early (apparently in the 4th century), but it still remains exceptional beside the stronger and earlier form. By the Hellenic masters

the Ionic column was never employed in the peripteral arrangement, but only between antes and in interiors.

The capitals of the antes (Fig. 88 b) have no volutes, but merely mouldings decorated by hearts, leaves and pearls. The base is formed by the Attic base, whose section also extends along the cell walls as a base moulding. The walls are sometimes subdivided by wall piers (pilasters), slightly projecting vertical wall bands having the width of the lower diameter of the column, base and cap mouldings, that are continued along the walls. Besides columns the Ionic style also employed as free supports square piers (propyleion at Priene) on bases with sections like those of columns, shafts diminished like the columns, the capital with small volutes peculiarly treated and with rich ornamental decoration. The free support rises to the highest artistic magnificence in its transformation into the human figures, the so-called caryatids, for which the maidens (kore) on the Erechtheion as supporters of the entablature, present the most famous example of classical beauty of form.(Fig. 89).

On the Ionic entablature the architrave is subdivided into three slightly projecting offsets, recalling the board covering of wooden construction, and has a crowning terminal member.(Figs. 81, 83). The frieze extends as an undivided beam; it bears rich figure decoration. The transition to the main cornice is formed by an egg-and-dart or heart-leaf moulding with a pearl bead.(Fig. 82). The main cornice for Attic buildings as a rule is treated as a bold geison, with a strongly undercut water drip on the under surface (to prevent the rain water from running back to the frieze) and an echinus moulding as the upper border. On the smallest monuments in Asia Minor (Fig. 83). a dentil band appears between the frieze and the geison, and judging from the Lycian rock-cut facades, this was transferred from the projecting ends of the ceiling beams or strips of a formerly wooden architectural style to stone construction.(Figs. 39, 40). On the inclined pediment cornices the dentils are omitted. The crowning termination is composed of the crown moulding, the moulded cyma decorated by a band of palm leaves (anthemion). In the ceiling the motive of the cof-

coffers in subdivisions and ornamentation produces a bolder and richer effect. All cymatiums, Ionic and Lesbian, are decorated in relief, similarly to the ornamentation of the cyma. (Fig. 102). The different members, in comparison to the severe organism of the Doric order, still appear with all harmony of the parts to each other to have far greater freedom and independence. Likewise the arrangement of the columns is in no wise dependent on the frieze. Therefore the Ionic style represents a considerably richer and more easily applicable architectural system than the Doric.

The Aeolic style.-- Our knowledge of Grecian architecture was enlarged in unexpected measure in the most recent time by the researches of R. Koldewey on Attic soil. The ruins of a temple of ancient Neandria discovered in the Troad in the year 1889 yielded a peculiar form of capital, unknown previously. (Fig. 84). It consists of a band around the column and is decorated by recurved leaves in relief, a round lying above this, treated as a cymatium closed at both sides, and a volute portion, whose spirals are not developed from a horizontal cap, but appear to grow vertically from the shaft of the column. (Perhaps this refers to two different capitals, one formed as a volute portion, the other with a circle of leaves with a round). The entire form treatment indicates a connection with Asian and particularly with Persian forms. (Fig. 33). The temple itself indeed dates from the 7th century. It consisted of a walled cell on a high substructure, which was apparently surrounded by an open portico (6 x 11 columns) and was divided into two aisles by a colonnade, like the so-called temple of the 6th city of Hissarlik - Troy and the so-called basilica at Paestum. The columns had smooth round shafts, strongly diminished, that stood on the ground without bases. Other peculiarities in style could not be determined. Also at Columdado on the island of Lesbos and even on the Acropolis at Athens were found fragments of this capital with the remains of the antepersian period. It is repeatedly represented in architectural views on vases. Thus we do not stand before an isolated work, but before a peculiar style form developed by the Aeolian race, from which indeed so far remains only this one

characteristic form of the column. We strikingly find no reference to this Aeolic style in the later writers. It probably originated in the 7 th century under oriental impulses and was developed in a closely restricted domain, but in the 5 th century under the influence of the Hellenic art spirit, to which this construction did not correspond, again disappeared. It never attained the importance of the Doric and Ionic styles.*

** The view expressed on the other side, that the form of capital found in Meandria only conceives a kind of sport of the Ionic capital, I am unable to accept, since that form evidently came from an entirely different conception in art, than the Ionic capital; likewise it cannot be introduced without innate contradiction into the organism of the Ionic order, even in the earliest stage of its development now known to us.*

In the second half of the 5 th century appeared an innovation of great importance to Grecian architecture in the evolution of the Corinthian style. With the refined feeling of the 56 Greeks for form and the progressive development of their art into classical purity must gradually appear the need of obtaining a form of column, that is freed from restrictions and the limitations in placing the columns of the Doric and Ionic orders, permitting a general use and giving opportunity for the richest development of forms. This aim was attained by the formation of a new capital with the introduction of plant motives in its architectural treatment. The invention of this capital was attributed by the Roman architect and writer on art Vitruvius to the sculptor Callimachos of Corinth (about 431 to 404 B. C.). He should then have been the first, who took the bell form as a basis and enclosed it by a series of upright leaves from which arose scrolls, that were coiled like volutes beneath the abacus. Actually this capital is also found for the first time in its complete development on monuments, that owe their origin to about that time (on the temple of Apollo at Bassae near Phigalia about 430). An earlier use by the Greeks cannot be proved with certainty. The basal form of the Corinthian capital was already prefigured in the second thousand years B. C. in ancient Egypt with the use of the plants native there. (Fig. 19). But the Greeks sought in their

own flora and adopted the broad, soft, toothed, thistle-like ribbed leaves of the acanthus (bear's foot), conventionalized in combination with scrolls, and thus created a new element for ornamental art, that in sequence became the basis of the entire ornamentation of the antique and of the art influenced thereby.

The Corinthian capital was treated in two main forms. Each of them is composed of a pearl bead as a neck ring (astragal), a flower bell expanding above this, and the abacus. In one and the simpler form, the lower half of the bell is covered by a series of eight acanthus leaves with recurved tips and growing out above the astragal, in the upper portion being twice as many sedge leaves, that sprout forth from the astragal behind the acanthus leaves, their points extending to the underside of the abacus. (Fig. 85). The other and more common form has two rows of unequal height, eight acanthus leaves in each, from which grew eight strong scroll stems, which in pairs form volutes beneath the angles of the abacus, and thus in the happiest manner cover the underside of the abacus projecting beyond the curvature of the bell, at the same time strongly expressing the motive of support. (Fig. 86). The abacus itself is square in the earlier and simpler form, but in the later is strongly incurved at the middle, generally with the angles cut off and always moulded. Thus was obtained a form of capital, that embodies static life in a wonderfully rich effect, and as a result of its similar treatment on all four sides, permitted the entirely free employment of the Corinthian column for peripteral plans.

The remaining architectural members of the Corinthian column (Fig. 87) are taken from the Ionic, but are still more richly and carefully treated and decorated. The base of the column consists of the Attic Ionic base, mostly with a square plinth. The shaft is like that of the Ionic column and is indeed monolithic (of one stone) for small dimensions, composed of drums for larger ones. Of the care with which these drums were connected together in view of the slenderness of the columns, the construction with dowells is characteristic; two or four iron dowells were let into the upper bed of each drum near its mar-

margin (at a distance of about $\frac{1}{3}$ of the radius) and set with cast lead. Afterwards the next drum, when the dowell holes had been drilled in its bottom surface to correspond was set, and then through a small hole drilled from the outside, the upper dowell hole was entirely filled with lead, in order to ensure an absolutely solid connection of the dowell with the upper stone. The antes and pilasters are imitated from those of the Ionic order (Fig. 88 c), as well as the entire entablature. The frieze in some cases exhibits a notable innovation, in that in place of its front visible plane surface a curved one occurs, either swelled in section like a flat circular segment, or with the elastic movement of a vertical ogee. In this case the frieze remains without ornament. The main cornice was finally developed further into the cantilever (bead end) and the modillion (console) cornice, when above the dentil band was inserted a separate structural member, to which was given the form of the lower beam ends or consoles with volutes. (Fig. 131). All cornice and moulding forms received an extremely refined treatment, permitted by the excellent material, chiefly white marble. The crowning structural parts, the bordering bands and intermediate members of the entablature, the capitals of the columns, and even the bases of the columns are frequently decorated most luxuriantly with sculptured ornament. -- In the Corinthian style the fullness of ideal life attains the richest flowering; it elevates Grecian architecture to its highest expression of artistic grace, freedom and magnificence.

Concerning the proportions of the columns to the entablatures the following Table gives more definite data for certain monuments of the Doric, Ionic and Corinthian orders.

(See Table on the next page).

	Feet.	←	Ratio to lower diameter of column.	→	
					Lower diameter.
					Distance on centres.
					Total
					Height of column.
					Height of base.
					Height of capital including necking.
					Total height.
					Height of architrave.
					Height of frieze.
					Height of cornice
					Total height from bot- tom of base to top of entablature.
1. Doric order.					
88 Temple Poseidon, Paestum.	6.76	2.1 to 2.2	4.3	---	0.48 1.77 0.70 0.67 0.40 6.07
Temple Parthenon, Athens.	6.46	2.0 to 2.3	5.5	---	0.46 2.00 0.74 0.83 0.43 7.50
Propyleion, Athens.	5.12	2.33	5.99	---	0.47 1.86 0.79 0.80 0.27 7.85
2. Ionic order.					
Temple Nike, Athens.	1.74	3.37	8.08	0.49	0.54 2.58 0.90 0.90 0.78 10.66
Temple Athena Polias, Priene.	4.10	2.73	10.8	0.62	0.55 1.88 0.77 0.62 0.49 12.68
3. Corinthian order.					
Tower of Winds, Athens.	1.64	4.87	8.26	---	1.08 1.83 0.62 0.50 0.71 10.09
Monument of Lysicrates, Athens.	1.08	3.10	10.00	0.66	1.45 2.34 0.85 0.66 0.83 12.34

The data here given for the Grecian architectural system and its "columnar orders" however in nowise prevailed for the Grecian masters as fixed and binding rules, according to which they should proceed with monotonous severity. By differences in the local and contemporary conditions in regard to purpose and materials, by regard to inherited opinions and particular circumstances, considerable variations from the general standard became compulsory. Likewise for purely esthetic reasons, men did not adhere strictly to mathematical accuracy and geometrical severity; they rather sought to soften these by scarcely perceptible variations in the intercolumniations of the columns * and those slight deviations, by which they removed from the continuous horizontal edges, especially those of the entablature, the lifeless impression of a rigid straight line and also gave them an innate life by curvatures. * *

** Also compare page 88 on the proved deviations of the axes of columns from the vertical for several Doric buildings.*

** * Such "curvatures" are now proved on most Grecian temples preserved to us, particularly on those of the Doric order (on the temple of Poseidon at Paestum, they strike even the slightly trained eye, as soon as one is placed in the direction of the two longer sides). With the unequalled perfection of the entire construction of Grecian temples it is indeed not doubtful, that they were intentionally produced as an enhancement of that refined Hellenic art in design, that likewise animated the shafts of the columns by their entasis.*

III. The ornamental perfection.

The endeavor of the Greeks to treat the temple as the highest ideal of formal and artistic perfection, soon led to an intimate connection of architecture with painting and sculpture and to a rich decorative ornamentation of different structural members. Thereby did it not only receive a higher consecration but also an enhancement in effect, by which the artistic expression also received a striking relation to the purpose of the building and to the problems of the architecture. The materials originally employed (poros and travertine) already indicated by their nature the necessity for covering the architectural members with a fine coating of stucco (made of sand, lime and freshly calcined gypsum or marble dust), to which then

with the joy in color native to inhabitants of southern countries, was added a carefully graduated but animated coloring, or polychromy. To the painting practised in this manner men also adhered later, when for the visible architectural members a nobler material, marble, came into use. For the earlier assumption, that a delicate yellowish tone was given to the entire temple, no proofs free from objections have been brought forward. On the contrary, by many vestiges of color on the ruins of temples in the most distant countries, it is shown with certainty, that on the Doric temples the stylobate, the columns, cell walls, the architrave and geison, thus all the main portions of the structure, were white, and thus they were left in the natural color of the stucco or marble. On the other hand certain separate members were treated with color in a harmonious way, the triglyphs and the mutules (*viae*) of the geison corresponding to them were always blue, the underside of the geison between them and the upper member (*taenia*) of the architrave were red, the drops being yellow or red. The metopes as a rule then merely received a red or blue ground, if such appeared necessary to make prominent the relief ornamentation. On the capitals of the columns usually only the annulets exhibit a red coloring; the echinus but rarely appears in the form of a series of leaves with recurved tips. So much more richly was the ante capital treated. Also the interior acquired a harmonious animation by a colored treatment of the walls, the ceilings and the different members. As color hues were merely blue, red, yellow and gold, and for foliage ornaments green also sometimes came into use.

Likewise on Ionic and Corinthian temples were shown vestiges of the polychrome treatment of certain structural members. Men apparently followed there the same principles, that may be recognized on Doric buildings, particularly in the later (Hellenistic) period, in which unusual richness in variegated kinds of marbles was developed in covering the walls, and bronze ornamentation was added to enhance the effect, when even capitals were made of bronze and gilded, a broader field must have fallen to polychromy. In the animated coloring, by which men gave an ideal ennobling even to sculptures in relief (the so-

so-called sarcophagus of Alexander etc.), we have the best examples of this.

To what a climax of the purest art the Grecian temples also rose in their sculptures, we may see in that masterly form of a maiden of honor on the Erechtheion (Fig. 89), who is fully conscious of her high service, full of grace and dignity to bear the graceful entablature of the house consecrated to the deity; we see that on the incomparable pediment figures of the Parthenon, which exhibit such an elevated and monumental conception of art and such a pure perfection of form, as attained by no other works of antique sculpture, and that give us an extremely charming picture of the representations of the Hellenes concerning the life of the blessed on Olympus; we see that also on the splendid figure frieze of the altar of Zeus at Pergamon (Fig. 105).

That likewise the monumental paintings with which the interiors of Grecian temples and their vestibules were adorned, were scarcely inferior in their productions to those of sculpture, is already proved to us by those imitations of famous paintings in antiquity, which have been preserved to us on numerous Greek vases, in Etruscan tombs, and in Hellenistic Pompeii.

An important part also falls to ornament in Grecian art and decoration, particularly in the pottery and the minor arts. In its earliest stage decoration bears all the characteristics of a crossing of the tendencies common to many European peoples with the influences expressed by the imitation of articles introduced from ancient Assyria and Egypt. But when these were filled with the Greek spirit, so that the primitive forms were no longer to be recognized, and finally all threads were cut, that could facilitate relations with oriental civilization. The Grecian art spirit manifested itself from the beginning onward in an unusually acute perception of the essential and characteristic, for the proportions of figures and the expression of movement, for schematic conventionalization, and a wonderfully refined feeling, with which they fitted the representations of figures into the scheme of the ornament. The best motives (aside from the architectural decorative members already mentioned) are the fret, the falling wave, interlaced and

rosette bands, palmations, flower corollas, scroll forms (Fig. 90) and acanthus leaves, the characteristic treatment of the latter foliage being shown in Fig. 91. The combination and arrangement of these form elements as architectural ornament (Fig. 91 b) as well as on Grecian vases and on utensils is so well conceived, so carefully weighed and classical, that until the present day it has been accepted as the unexcelled and truly classical model for all ornamental art.

Just as the architectural styles were not developed separately but beside each other, we find them also employed at the same time and place, indeed frequently on the same building. For example, on the larger Doric temples, if two colonnades above each other were not arranged for the internal rows of columns, so that the side aisles had two stories, a more slender system was generally chosen, and thus of the Ionic or Corinthian order. With the diversity in the character of the different styles, with the change in the political power of the races, from which they came, and also finally with the inequality of the problems set for architecture, it was therefore certain, that the different styles attained their climaxes at different times and entered the foreground, the Doric in the 5th century, the Ionic in the 5th and 4th, and the Corinthian style in the 4th century and the following period.

IV. The most important monuments.

Aside from the preliminary stages mentioned on page 66, we can assume the real beginning of Grecian temple architecture at that time, in which the formation of states was completed, and the national unity found its strongest expression in the founding of the common festivals, at the introduction of the Olympiads in the year 776 B. C. Thereby classical Grecian architecture commenced its course of evolution, that comprised a period of six centuries, and which may be subdivided in detail into the epochs given on page 54.

1. THE ARCHAIC PERIOD. (776 - 476). -- We find the best preserved monuments of the temple architecture of the early epoch in a great number of temple ruins in the greater Grecian colonies in the west, chiefly being peripteral structures with elongated and narrow cells, frequently with a rear apartment

(adyton) accessible therefrom, the cell single-aisled in the first times, or with a middle row of columns, as at the so-called basilica of Paestum; massive forms in the external structure, the columns with strong diminution and unusually great entasis, the entablature heavy and not yet fully developed, with uncertain proportions in general (lax archaic style).

a. Doric monuments. -- In lower Italy and Sicily:- at Paestum (Poseidonia) the so-called "basilica", a peripteral building with 9×18 columns, and the somewhat later temple of Demeter (Ceres) with 6×18 columns; the capitals still with hollows, date of erection about the middle of the 6th century. In Selinunt (Selinus) stood seven temples, mostly peripteral, among them four of the 6th century, all destroyed by an earthquake. In Girgenti (Akragas, Agrigent), the temple of Heroules (6×15 columns). In Pompeii; the ancient Grecian temple on the triangular forum, pseudodipteral with 7×11 massive columns, strongly projecting and swelled capitals with hollow in the necking. In Syracuse, the temple of Zeus and the temple of Apollo in the adjacent island of Ortygia.

In Greece:- the temple of Hera (Heraion) in Olympia, the earliest example of the Doric style still preserved in notable remains, peripteral with 6×16 columns, dimensions of 62.3×164.1 ft., originally a wooden structure from the time before 700. The wooden columns were gradually replaced by stone, the oldest capitals still having the hollow beneath the widely projecting echinus. * The temple in the citadel of Corinth (Fig. 92), peripteral, 6×15 extremely heavy columns (height about $4 \frac{1}{4}$ lower diameters), but on which the hollow is already wanting. The temple on Egina, dedicated to Athene or perhaps also to Artemis, peripteral, 6×12 columns, from the beginning of the 5th century; the columns comparatively widely spaced and slender, but still with archaic projecting capitals; famous pediment group in Munich.

* According to Grecian tradition the oldest Doric temple was the Argive temple of Hera near Mycenae. No certain idea of its plan can now be obtained from the very few remains discovered in very recent times.

In Asia Minor, the temple at Assos on the Aeolic coast with

6 × 13 columns, whose shafts only exhibit 16 to 18 flutes each.

b. Ionic monuments. -- The earliest work is the temple of Hera on Samos, built in the middle of the 6 th century by Rhoikos and Theodoros of Samos; but very few fragments of the columns have remained. The same Theodoros also commenced the temple of Artemis at Ephesus, a colossal dipteral structure 246.1 × 525.9 ft. long, with architrave beams 32.8 ft. long, greatly esteemed as the architectural wonder of the ancient world, as its actual builders being mentioned Chersiphron and his son Metagenes, but about a century later was completed by the architect Paionios and the foreman Demetrios. According to tradition this sanctuary was set on fire and destroyed by the act of a demented person, but was again rebuilt by Alexander the Great (see page 88). Near Miletus, the famous sanctuary of Apollo Didymaios (Didymaion), likewise a colossal structure, from which since the destruction by the Persians in the year 492 only the ruins of the mighty seated figures remain, which were placed along both sides of the avenue of access, like the rows of sphynxes before the Egyptian temples. (The temple was again restored after the Persian war. See page 88).

With the religious buildings are also further to be restored the treasuries at Olympia and Delphi; founded as consecrated architectural gifts by certain states, built of native stone as a rule, and erected on the Altis (the sacred precinct) at Olympia and the enclosure of the oracle at Delphi. Already for this reason and in view of their rich sculptured ornamentation is this a class of buildings of importance in the history of architecture. They have a vestibule with pediment and supported by columns like the ante temples, but already differ from these by their location at right angles to the direction of the temple, since these extended from West to East, but the treasuries from South to North. (See Fig. 96).

2. THE BEST PERIOD. (476 - 338). -- With an event of the highest importance in the history of the world, the glorious war against the Persians, Greece enters the magnificent epoch of civilization, whose artistic development never again finds its like in history. After the powerful repulse of oriental encroachment by the sword, there also vanish the last vestiges

the oriental elements from Grecian art forms; Grecian architecture acquires a refined and purely national treatment. The Doric style enters into its full maturity in the Italian colonies as in the mother country. But the centre of the evolution in the history of art lies on the native soil in Athens, just like that of the political history. There Hellenic art rose to the climax of most perfect harmony and beauty. From the Doric style also vanished the last traces of rude and archaic conceptions; it was transferred into gay clarity and the noblest grace. The Ionic style developed its highest bloom, and soon the Corinthian style also appeared, to enhance Grecian architecture as the most finished and magnificent effect of artistic splendor.

a. Doric monuments. -- In lower Italy and Sicily:-- in Selinunt the temples A, B and E, not mentioned on page 79, in Akragas (Agrigenti) the unfortunately very ruinous so-called temple of Juno Lacinia, the still well preserved temple of Concordia, peripteral with 6×13 columns, the temple of Castor and Pollux, a picturesque angle of which, consisting of four columns with the stylobate, entablature and the starting block of the pediment, with in part the well preserved stucco coating, has been recently rebuilt from the existing remains; the great temple of Zeus, 183.7 ft. wide and 397.0 ft. long, pseudoperipteral with 7×14 columns of colossal dimensions attached to the cell walls (a man can find comfortable space in a flute), massive wall piers in the interior, on which (in the upper third) are colossal atlantes (male figures) 26.3 ft. high to support the ceiling; it now only forms a vast heap of ruins. In Segesta (Egeste), a principal structure with 6 columns in front, still standing with its entablature and pediment but never completed. In Syracuse the temple of Athene on the island of Ortygia. In Paestum the great middle temple, sanctuary of Poseidon (Figs. 92 - 95), peripteral with 6×14 columns, a vestibule between antes in the pronaos, open opisthodomus at the West, cell in three aisles, the side aisles two story (Fig. 93), the upper gallery accessible by stairways. The metopes are equal, the angle columns being chosen to correspond, the architectural treatment still strong and earnest. The temple of

Poseidon, next to the Theseion on the market hill at Athens, is the best preserved architectural monument of the great style from Grecian antiquity. Today it still produces an overpowering and even thrilling effect in the quiet abandoned landscape.

In Greece:- at Olympia (Fig. 96 z), the great temple of Zeus built by a master Libon from Elis, peripteral with 6×13 columns, plan similar to that of the temple of Poseidon at Paestum, in its forms still showing the transition period from archaism to the best time. There also the temple of the mother of the gods, the metroon (m). At Rhamnus in Attica two Doric temples of Nemesis, an earlier small ante temple and a hexastyle peripteral temple with 12 columns on the longer side in the most mature Attic Doric style. In Eleusis the temple of consecration (Telesterion) designed for the use of the mysteries by Iktinos about 440. At Argos the temple of Hera, which was erected by Eupolemos on the site of a very ancient sanctuary about 423 and on a similar normal ground plan. At Nemea the great temple of Zeus, at Tegea the temple of Athena Alea, on Delos the great temple of Apollo, all these being peripteral with 6 columns on the facade, among which that at Tegea is notable, since on it all three columnar orders were employed, Doric in the peristyle, Ionic in the pronaos, and the Corinthian within the cell. At Phigalia the temple of Apollo (Fig. 67 b), newly erected about 430 after plans by Iktinos, peripteral with 6×15 columns, but with entrance end toward the North, thus being at right angles to the earlier temple; in the interior five cross walls projecting from the side walls, that end in Ionic three-quarter columns, on the axis being a column with Corinthian capital, the oldest known example. On this temple are found for the first time all three orders. In Athens the so-called temple of Theseus (Theseion) on the market place, a peripteral structure of Pentelic marble with 6×13 columns (Fig. 97), the best preserved of all Grecian temples.

86 Its highest and noblest development was attained by the Attic Doric style on the Acropolis of Athens, the city citadel erected on a high plateau of rock about 984.3 ft. long and 426.5 ft. wide (Figs. 98, 99), in the Propyleion and the sanctuary of Athena Parthenos, the Parthenon. The Propyleion forms the

magnificent gateway built by Mnesicles in 437-432, accessible by a monumental wide flight of steps, and consisting of a middle and two side buildings, the central building with hexastyle Doric porticos at the entrance and exit ends, between them the entrance hall in three aisles with two rows of three Ionic columns in each, the two wing structures with open porticos toward the entrance, the left (larger) wing forming the "pinacothek" (picture gallery), the right somewhat smaller on account of the adjacent temple of Nike. Like all monuments on the Acropolis, the execution exhibits the highest artistic perfection. In the interior of the area of the citadel and approximately at the middle, there stood a Doric temple of Athena, already famous in antiquity, whose cell was 100 ft. long, from which it received the name of "hekatompedon". It was destroyed in the year 480 by the Persians, but was later rebuilt. About 98.4 ft. South from this a temple dedicated to Pallas Athene was commenced, but this was again torn down under Pericles, after on the advice of the great sculptor Phidias he had given the order to the architects Iktinos and Callicrates, to erect in Pentelic marble on its site a sanctuary consecrated to the maiden goddess Athene. So then from 447 to 434 was erected the "Parthenon" of Pericles (Fig. 100), beside the Erechtheion the noblest monument of Grecian architecture, peripteral and amphiprostyle, measuring 228.5 ft. in length and 101.3 ft. in width on the upper step and with 8 x 17 columns, peristyle, pronaos and opisthodomos, the cell with three aisles, each internal row of columns with two Doric colonnades above each other, between the cell and the opisthodomos being the proper "Parthenon", accessible from the latter, that either served as another room for worship, as a western cell, or as a treasury for the safe keeping of the national treasures. The columns are comparatively slender and are slightly diminished with scarcely perceptible entasis; the capital has a restrained echinus with almost a straight line as section and a but slightly projecting abacus. (Fig. 74). In the Parthenon Doric architecture reached the climax of the course of its evolution.

b. Ionic monuments:- in Hellas the Ionic style only appeared in the smaller architectural works. But these adopted a s

scale so much greater in the Eastern colonies. On the Acropolis of Athens the little temple of Nike Apteros was built on the extreme southwest projection of the rock of the citadel at the right of the entrance, a tetrastyle amphiprostyle structure of Pentelic marble with a magnificent relief frieze.(Fig. 76). At the middle of the area of the citadel and at its northern margin was the famous Erechtheion (Fig. 161). The uneven ground here led to a charming and picturesque temple design, that was not indeed surrounded by a peristyle, but instead had open porticos on all sides. The main building is an Ionic hexastyle prostyle temple extending toward the East with a cell in three aisles but transversely divided at the middle, the eastern portion being dedicated to Athena Polias, and the western to the three ancient Attic earth gods, the latter being lighted by three windows raised high in the western wall. The northern wall of this western cell has before it as a portico an open hall with pediment and six columns, from which one entered the sacred room through the beautiful "Erechtheion" portal.(Fig. 102). But against the southern wall is built the small "caryatid porch" with the colossal marble maidens (koren, korai), that support the graceful cornice, only composed of an architrave, dentil band and geison (without frieze).(Fig. 89). The rich capitals of the northern portico are shown in Fig. 80. The whole is an incomparably graceful architectural work of the highest nobility of form, refined proportions and members, the climax of Attic Ionic architecture.

In Asia Minor, the temple of Artemis at Ephesus, rebuilt by Deinocrates (Cheiocrates) about 350 after the ancient plans but with freer forms (see page 80), on which the columns (as columnae caelatae) had the lower portion of the shaft covered by relief sculptures, manifestly in imitation of oriental covering with metal. Paeonios with the cooperation of the foreman Daphni also entirely rebuilt the great Ionic temple of the Didymean Apollo at Miletus, destroyed by the Persians, as a colossal dipteral structure (10 × 21 columns, 65.6 ft. high above a stylobate of 13 steps).(Fig. 86). But it was completed in the Alexandrine period. In Xanthos in Lycia the monument of the Nereids, erected on a high substructure as a tomb, a t

temple with 4×6 widely spaced columns and double cell with rich sculpture on the architrave; the frieze is lacking. In the Troad, the temple of Apollo Smintheus, pseudodipteral on a high substructure, to which probably led up only a single flight of 10 steps on the front side. At Priene the temple of Athena Polias, built by Pythias, whose columnar order may pass for a model example of the matured Asian Ionic style. (Fig. 83). It must have been dedicated in 340 B. C. by Alexander the Great, and designates the last stage of the Ionic style of this period.

The Corinthian order found employment seldom in temple architecture during the classical period, and indeed only in the interior of the cell. The earliest monument exhibiting Corinthian columns externally (the Lysicrates monument) already belongs to the Hellenistic period.

3. The Alexandrine or Hellenistic period. (338 - 146).

With the beginning of the Macedonian supremacy fell the political greatness of Greece. The misfortunes that closed in upon Athens from the Peloponnesian war and its consequences had a destructive effect upon all political life. The people lost ever more the faith in the gods, already shaken by the new philosophical ideas, and thereby its high ideals. The once strongly expressed national consciousness receded, and the existence of the state also lost its most important basis. National festivals were indeed held, but no longer to serve the gods, but only to satisfy the love of the people for enjoyment. No longer was it the state as such, from which art received its great monumental problems, but the need for show of the princes and the great of the land. But there also occurred a loss of the art principles striving for clarity and purity. The Doric style declined. The columns became very high and slender. On the shafts the flutes are omitted on the lower third. The capital becomes strikingly small as treated subordinately. The echinus has no longer any force; it has a straight line section. Even the entablature seems too low. The triglyphs are now only ornamental members, that were even arranged above Ionic columns. (Fig. 103). Soon are found mixtures of styles of all kinds. In the place of the ancient Ionic capital chief-

chiefly occurs the diagonal capital. The Corinthian capital is sometimes even enriched by figure ornament. Even oriental forms of columns and capitals (the Egyptian palm column, the Persian bull capital, Figs. 19, 33) intruded. The frieze was frequently swelled. In certain cases (on the great harbor gateway in Ephesus and the theatre in Termessos) the columns even became purely decorative, were placed before the wall surfaces with returned entablature.

After the political collapse of Greece, Athens enjoyed for a long time the favor of the new rulers. These did not desire the subjugation of the brave Hellenes, but they recognized the elevation of their civilization, and sought to acquire it and make it useful. Thus Grecian culture and Grecian art flowed out to the farthest limits of the immeasurable domain; so did it become the common property of the civilized peoples of every time. Hellenism civilized the world. Once more the Grecian spirit awoke in the architects of the new kingdom to new artistic great deeds. But the soil for this was no longer found in the mother country, but in the Asian and African possessions, particularly in the kingdom of Pergamon, and in the free state of Rhodes, that attained great wealth by its commerce. Different were in those provinces the basal opinions, the requirements and the means; but the artistic expression must also become different. Grecian architecture as such decayed. The severe restraint of its form must yield to a freer use and treatment. New materials were adopted by the native traditions of the provinces. Freed from the compressing orderliness of the system, enriched by new expedients, Grecian architecture received that universal character, which rose to a world language of art, which reacted in the Roman, Byzantine, Romanesque and Renaissance art until the architecture of the most recent period.

Monuments:- with the great flight of architectural activity temple architecture did not make equal progress; it visibly receded in comparison with the problems of secular art. In Athens M. Cossutius (about 175) erected on the site of an older temple the Olympeion, octagonal Corinthian dipteral, and next to the temple of Artemis at Ephesus the largest of all Grecian

temples. It never came to completion. There yet stand of it 9/ 15 columns, that with their height of 55.8 ft. filled the observers with astonishment in ancient times.(Figs. 87, 104). The period developed its chief activity in Asia Minor. In the ancient Grecian form of the rectangular peripteral temple, Hermogenes, an architect of genius, erected about 200 B. C. the third largest Ionic temple of Asia Minor, that of Artemis Leucophræe at Magnesia, a nobly developed pseudodipteral building on a stylobate of seven steps, as well as a stately hexastyle structure, the temple of Bacchus in Teos. But elsewhere the round temple was preferred; such most promising works are; the Philippeion in Olympia (P.H. in Fig. 96), a circular peripteral building founded by king Philip in 337 - 334, on a stylobate of three steps with 18 Ionic columns in the peristyle, the internal wall of the cell subdivided by 9 Ionic columns; the beautiful circular building in Epidauros (the so-called "tholos"),; the sanctuary of Asclepios with external and internal colonnades and extremely rich ornamentation (Fig. 91 a); on Samothrace the Arsinoeion, a two story circular structure dedicated to the great gods, with a plain substructure only broken by a doorway, and an upper story subdivided by 44 pilasters.

With the religious buildings of the Hellenistic period are reckoned as its most original creations the altar structures, of which the altar of Zeus at Pergamon presents the most splendid example.(Fig. 105). It was a monument of the great style, erected about 180 B. C., consisting of a massive substructure. 123.7×113.1 ft. in area and 29.5 ft. high, which a magnificent stairway of 24 steps and 65.6 ft. wide intersects. This led to a platform, on which stood the altar of burnt offering under the open sky, and enclosed on three sides by Ionic porticos (entirely around according to other restorations). Around the substructure and on the sides of the stairway extended a sculptured band 7.6 ft. high, representing the combat of the gods with the giants, that is to be counted among the most magnificent works of late Grecian sculpture. -- Of the Hellenistic buildings of lower Italy, we have mentioned the temple of Apollo at Pompeii on page 133.(Fig. 157).

B. Secular Architecture.

During the entire archaic and the best periods the temple formed the chief problem in Grecian architecture. But in the course of the 5th century secular architecture, which had previously moved within very restricted limits, also commenced an increasing development, until its works rose to be real art buildings and in the Hellenistic period occupied the foreground of artistic interest. With the high importance of the great national festivals and the dramatic performances there produced, contests and combats open to the world, all these received a careful treatment, that were designed for holding these and for the preparatory exercises, i.e., the theatre and the odeion for the dramatic and musical performances; the stadium as a race course for the youths competing in running, the hippodrome as a race course for horses; the gymnasium and palaestra as schools for the exercise of the youths.

In the 5th century the founding and the building of cities took an unusual upward flight. In them are found as continually recurring forms of buildings, the bouleuterion or council houses, the prytaneion or state palaces, and stoas, i.e., porticos surrounding the markets as walking places, accompanying the course of entire streets, also frequently serving as lecture halls. Finally the Grecian house also gradually received a typical plan. Even in utilitarian structures the Greeks attempted great works in the often splendidly treated fountain houses and the engineering structures of the partly grand and prominent harbor plans and the fortifications of cities. Among the purely artistic works are further reckoned the monuments executed in honor of certain citizens and the tombs.

The Grecian theatre (Figs. 106, 107) substantially consisted of three parts; 1, a long and narrow stage building, the skene, with two projecting side wings (paraskenion), between which the proskenion lay; 2, the orchestra lying beneath the open sky, a circular, also frequently semicircular or more rarely horseshoe shaped level area, with entrances (paradoi) from the paraskenions; 3, the surrounding and rising audience room (theatron, koilon, cavea) with the concentric rows of seats lying behind each other, that were generally divided into banks by

one or two curved passages (diazomatas, girdles), and were accessible by radially arranged stairway steps. (See plan and view in Figs. 98 and 99). The most important of the extraordinarily large number of remains of Grecian theatres are these:— that known as a model building and completed under the rule of Lycurgos (338 - 326) as the theatre of Dionysos at Athens, from which a portion of the audience room and the beautiful honorary seats represented in Fig. 108 still remain. The theatres at Segesta (Egesta), Syracuse, Aspendos, Epidauros, Priene, Delos, Magnesia, Termessos, and in Hellenistic Pompeii. -- In the vicinity of a larger theatre was also generally found an odeion, imitated from the theatre in smaller dimensions and chiefly intended for musical and lyrical performances. (See plan in Fig. 98 and view in Fig. 99).

The stadion had the form of a rectangle of about 656.2 ft. long and 72.2 ft. wide, constructed in a natural or artificial valley, frequently rounded at one or both ends and furnished with transverse stone sills as marks for the beginning and end of the course. The best known stadions are those of Athens, Olympia, Epidauros and Messene. The hippodrome was similarly arranged but on a substantially greater scale for the racing of horses and of chariots with two wheels.

The gymnasions, originally intended for the physical exercises of youths, were later also institutes for instruction and for their intellectual development, and the palaestras, schools for exercises in contests, mostly consisted of a square court entirely enclosed by porticos and halls, that opened inward. (See P.A. in Fig. 96). With the gymnasions were also connected bathing arrangements, but which there only served for cleansing and refreshing after the exercises. Important gymnasions were those at Elis, Olympia, Epidauros and Assos.

New principles for the laying out of cities were already established in the second half of the 5th century by Hippodamos of Miletus, relating to the location, direction of the streets, the proper arrangement of the streets, markets and public buildings, as well as for sanitary measures in reference to drainage etc. Numerous new cities were founded, particularly in the Alexandrine period, and they rapidly became great cities,

among them being Alexandria at the mouth of the Nile, Antioch on the Orontes, which belonged to the most populous and famous cities of the ancient world, becoming models for many others. In Asia Minor rose Miletus, Ephesus, Magnesia and Pergamon, and in Sicily Syracuse attained great magnificence. Columnar gateways (Fig. 109), porticos and courts with porticos gave to the streets, the markets and the Hellenic cities their artistic impression. The chief attention was devoted to the great marketplaces (agora). They generally had a rectangular plan. The dimensions varied; the marketplace of Magnesia was 816.8 ft. long and 318.3 ft. wide. On them came to its richest development the hall building as a protection against rain and the heat of the sun. Stoas also surrounded the markets, partly as walks, partly as lecture porticos. If chiefly intended for conversation, they were termed *lesches* (prating halls). The porticos were soon erected in two or more stories, as at the great marketplace of king Attalos II (159 - 138) in Athens. (Fig. 103). Therewith vaulted construction also gradually came more into use. Before this men had employed vaulting with *voussoirs* in round arches almost entirely in gateways (already after the 5th century in northwest Greece), for openings for water and over entrances (for example, at the entrance to the stadion in Olympia). They now advanced to the vaulting of the larger rooms, although still hesitating. As the first example of this passes the main hall of the gymnasium at Ephesus, that was covered by three cross vaults (see page 105) and indeed by all probability in the Hellenistic period. The principal entrances to the markets were spanned by monumental gateways.

95- With this is also to be reckoned the Tower of Winds in Athens, an octagonal structure with two small gabled porticos to receive a sundial and a water clock (*horologium*), and a frieze of figures in relief, representing the demons of the winds, and built by Andronicos from Cyrrhos.

On the great markets the *buleuterions* also received their places as the locals for the sittings of the state council and the *prytaneion*, the latter as the state palace of the Greek state, in whose square middle room and surrounded by porticos and halls, stood the sacred hearth of Hestia. The *Buleuterion*

of Olympia consisted of two two-story halls for sittings and with semicircular ends, together with a middle hall, all these hall structures being connected by a common Doric portico. (See B in Fig. 96).

The royal palace formed an entire quarter of the city. The palace of the monarch received a great peristyle, around which were grouped the rooms for holding the court, always including the throne hall, the chapel and the fountain house. Adjoining these were the chief sanctuaries, the public libraries, the museum and the like. (Royal palace of Pergamon). A similar plan is shown by the royal villas, which were erected in the midst of splendid gardens in the vicinity of the great cities.

In comparison to the purely decorative buildings, the Grecian dwelling takes a very modest place, chiefly because the political and social life of the men during the best period of Grecian art was chiefly spent on the agora and in the lesches, so that only a subordinate place fell to the wife and family life greatly receded. In the more prominent private houses was retained the separation between the men's and women's dwellings (andronitis from gynaikonitis), already existing in the Mycenaean royal palace. The vestibule open in front (prostas) was changed into the court with porticos and transferred to the interior of the house, and was treated artistically, while the houses next the street were almost entirely enclosed without any development of the facade. A direct access (thyroreion) led to the columnar court (peristyle, aula) from the street and around this were grouped the rooms (see Fig. 110), among them being regularly a larger principal room furnished with several windows toward the court (andron, oikos, oecus), and the entirely open or widely opened exedra as a conversation or dining room. In a richer development the women's dwelling lay behind the andronitis, was always only accessible from this and had its own peristyle, which was connected with the men's dwelling by a narrow passage (mesaulos). In the simple house the peristyle was common to both. The dwelling of the women and that of the slaves frequently was in the upper story (hyperoon). The materials evidently consisted of quarried stone only in the foundations, the other masonry being of air-dried

bricks, wherefore only very sparing remains are preserved.

A prominent place in Grecian private architecture is further assumed by the monuments, both those erected in memory of an important event, and the tomb monuments. Of the former, the most splendid example is presented by the choragic monument of Lysicrates, erected in the year 334 in Athens. This is one of the monuments, which the choir leaders, the so-called choragoi, were required to build, if they obtained the victory in the public musical contests. These monuments mostly have the form of a small round temple and are crowned by the tripod, the prize won by the victory. (Fig. 111). The monument of Lysicrates is 34.5 ft. high and consists of a square base 13.1 ft. high of Piraeus stone, and a circular structure of Pentelic marble with a crowning cornice, that is supported by Corinthian engaged columns 11.7 ft. high with capitals of extremely refined and graceful treatment; the whole is one of the most charming works of Grecian art. The tombs in Attica were always simple; on the heaped grave mound as a rule stood a stele (sepulchral column), i.e., a high and narrow stone slab diminishing upwards and crowned by a palm leaf acroteria with the name and also frequently the relief image of the deceased, a wider tombstone for a richer treatment, in which was frequently recessed a niche enclosed by pilasters with moulded pediment (heroon) for a relief slab with the portrait of the dead or a thoughtful figure group. (Fig. 112 b). But in Asia Minor the tomb reached a monumental development. The greatest monument is the mausoleum erected for king Mausolus of Caria at Halicarnassos, a magnificent structure, probably erected by Pythios and Satyros about 350, consisting of a massive rectangular substructure 116.8 × 87.9 ft., standing thereon being a temple-like hall with 9 × 11 Ionic columns, and a marble pyramid of 24 steps, which was crowned by the colossal statues of the king and queen with the quadriga (chariot with four horses). (Fig. 112 a). The substructure and superstructures each contained a circular cell 42.7 ft. in diameter and 55.8 ft. high to the vertex of the strongly raised dome, formed by corbelling out chamfered ashlar (according to Fig. 65). The rectangular sepulchral chamber is 22.3 × 13.8 ft. and 12.5 ft. high and lies beneath

the lower cell. The entrance was walled up. The height to the top of the tomb cornice amounted to 62.7 ft., that of the columnar order with entablature being 40.0 ft., and of the whole being 140.1 ft. to the top of the quadriga. We see in this monument the last truly ideal transformation and development of the tumulus form, native on the soil of Asia Minor, clothed in the form world of late Grecian architecture.

§ The entire development of Grecian architecture exhibits to us a wonderful tendency and a passionate impulse to express a spiritual harmony in more beautiful and perfected form. Originally derived from the structural idea, it rose gradually to a perfected space art, in whose individual harmony and beauty the idea of construction entirely disappeared. Thus the Grecian spirit created the basis for a really perfect, an art fully blooming in its external conditions, the classical model, that was nevermore to be excelled in style. When the Greeks had reached this climax, they only retained their political independence for a comparatively brief time. But in the domain of the intellect, they entered on their rule. The overflow of Greece by the foreign conquerors set in motion anew the great stream of civilization from the East, which five centuries earlier had come to rest in the Hellenic lands. It rolled on farther to the West, in order to develop on the western peninsula of the Mediterranean Sea the second great period of antique art, in a new and in many respects a yet richer and more splendid development.

VII. Architecture of the Etruscans.

98 In the middle and northern provinces of the Italian peninsula, already before the settlement of the south by the Grecian colonists, the races settled there at the earliest time reached by history had developed their own civilized life. As different as are the climatic conditions of the elongated country, intersected by a high range of mountains, just as unlike were the ancient Italian population in derivation and character. The innate artistic endowment of the Greeks was not native in one of the many races, but so much the greater was the capacity to adopt foreign acquisitions and to work in their sense. The most important place among them was occupied by the Etruscans, also called Tuscans by the Romans and Tyrrhenes by the Greeks. According to their language and their customs they were an independent people, apparently allied to no other race. But their form of civilization and traditions indicate Asia Minor as their primitive home, where they stood in intimate relations to the Lydians and the Phrygians. They probably emigrated during the Doric migration, as their most western offshoots settled in the province named Etruria after them, there formed a separate state, extended their possessions ever wider, had subjected Latium at about 700 and Rome about 500, then dominating the entire civilization of middle Italy, but in time were continually forced back in the north and east by the Gauls, in the southeast by the Sabines, Samnites and the Grecian colonists until beneath the storms of the migration of the Gaulish nation and the contest with the Roman people, they entirely lost their independence in the 3rd century and also later their national unity, their national customs gradually merging 99 in the Roman. In their religion appeared in the earliest time predominating Egyptian and Babylonian influences, whose gloomy conceptions were but slightly softened by the animated and imaginative ideas of the Greeks. But in the later time the world of Grecian gods gradually found admission among the Etruscans.

The earliest Etruscan architecture exhibits the same basal traits as the Mycenaean. As there is found there Cyclopean masonry in the walls of cities and citadels, both polygonal and in ashlar in massive and most careful execution. (Ruins in Cosa, Cori, Segni, Ferentino, Fesulae, Volterra etc.). The cov-

Covering of gateways and interiors occurred in the early period by corbelling out horizontal courses. (Fig. 65). The best known examples of this are furnished by the very ancient Capitoline fountain house in Rome (in its lowest room), and the spring house under the wall of the citadel at Tusculum. Later, from about the 5th century, and manifestly under Grecian influences (see page 94) was executed the regular voussoir construction in round arches, in which the Etruscans eventually proved themselves skilled masters in their great city walls, their utilitarian structures and bridges. On the so-called arch of Augustus in Perugia (Fig. 113), the carefully coursed ashlar masonry of the substructure (up to the springing lines of the arch) dates back to the Etruscans. The arch and the superstructure above were restored after the destruction of the city by Caesar Octavianus (later the emperor Augustus), and indeed by an Etruscan master, as may be judged from its form treatment. As also on the Porta Marzia in Perugia, the Etruscans here employed the voussoir arch decoratively in an important way, when they enclosed the arch by a moulding. For the public buildings and dwellings was preferred the structural woods, existing in good quality, in combination with air-dried bricks and terra cotta covering. Its chief activity was developed by Etruscan architecture especially in accordance with the practical and useful tendency of the people in the domain of secular architecture, particularly in the plans of cities and dwellings. Yet their architecture of temples and especially their sepulchral architecture presents a high interest for the history of architecture.

In a determining way have the Etruscans influenced the plans of the ancient Italian cities, when as already in their pile villages located in the valley of the Po, they based these on a definite network of streets intersecting each other at right angles and orientated according to the four points of the compass. We already recognize in their dwellings the ground traits of the later Roman dwelling. (Fig. 114). They generally have a square middle room (atrium), in which stands the hearth, extended by a wing (ala) at each side, behind the atrium being the living room, also between them being small side rooms, the

whole covered by a high roof. Since with this plan light and air could only enter through the entrance doorway, the two wings and the openings in the gable, there soon resulted in cities the necessity of directly lighting the atrium and of ventilating it by the arrangement of a rectangular opening (compluvium) in the ceiling. (Fig. 115). The surfaces of the roof were then sloped inward (Fig. 149), and a collecting basin (impluvium) for the entering rain was arranged in the floor of the atrium. But the atrium remained without supports for the ceiling. (Etruscan atrium). The hearth (focus) was soon transferred to a separate room, the kitchen, and the room behind the atrium on the axis was arranged as the principal apartment. (tablinum). This plan was the rule for the ancient Italian house and was retained until the 2nd century, in which occurred a further transformation through Grecian influence.

We are instructed by Vitruvius in regard to Etruscan temple architecture, whose statements are supported in general by recent excavations. According to these the Etruscan temple chiefly consisted of a high substructure (podium) of approximately square area with three cells, entirely separated by partition walls, and a vestibule composed of three rows of columns, whose outer row was continued to the rear wall extending the entire width. (Fig. 116). In elevation and in the members appears to us a certain conformity with the older Grecian and the architecture of Asia Minor (Fig. 117), in a partly weakened and also partly strengthened, but chiefly conceived ornamentally, use of the Grecian architectural members, whose treatment lacks a refined feeling for form. The Doric-Etruscan column has a plain and low plinth or even a torus-like base, sometimes profiled in the form of an inverted ogee, a plain strongly diminished and frequently swelled shaft, and a capital of the Grecian-Doric type, but with necking and astragal. (Fig. 118). The Ionic capitals show the but slightly developed early Grecian treatment, and the Corinthian (Fig. 115) have the bell form already developed by the Egyptians with sprouting volutes (helices), but from the 4th century also the richer treatment with busts between the volutes. Piers, pilasters and atlantes were also employed as supports of the entablature and ceiling, having bases and capitals shaped like those of the columns. T

The entablature was divided into architrave, frieze and strongly projecting cornice, and it consisted of wood with a covering of terra cotta. The roof was constructed and covered like that of the Grecian temple. The most important monuments are the ancient Etruscan temples recently discovered near Falerii and Marzobotto, as well as the historically notable Capitoline temple of Jupiter, Juno and Minerva at Rome, completed in the year 509 and burned in 83 B. C.

121 The most interesting portion of the monuments is formed by the tombs, to which was given an extremely careful construction on account of the expressed belief in immortality of the Etruscans, recalling the religion of the Egyptians. The Etruscan tombs in the earlier time (before the 5th century) chiefly have the form of the tumulus tomb, previously described among Lydian monuments (page 35), with monumental construction on a circular wall enclosing a mound of earth (tumulus tombs in Caere and Tarquinii, now Cervetri and Corneto), frequently with structures like towers on the base enclosing the sepulchral chamber. (The so-called "Cucumella near Volci and the so-called "tomb of the Horatii and Curiatii" near Albano, indeed already belonging to the later period. Fig. 119). In the mountain regions of the land came into use quite early the subterranean rock-cut tomb with spacious chambers for the dead, which give us faithful representations of the former dwellings of the living, by their full equipment of house utensils, in the benches against the walls and cut in the rock, seats, doorways and false doors, in the mural paintings, and even in the forms of ceilings. (Fig. 120). The paintings are applied on fresh lime, thus being frescos, treat of funeral feasts, dances and the like, and are strongly influenced by the style of Grecian vase painting. In the Hellenistic period are added to the gloomy ancient Etruscan demons also the lighter forms from Grecian mythology.

Monuments:-- the Etruscan tombs of Tarquinii (Corneto), Caere (Cervetri), Clusium (Chiusi), Veii, Vulci and Orvieto.

The Etruscans were likewise excellent potters and makers of vases, masters in metal working (bronze-casting and refining), and all the minor and ornamental arts. Well known as scattered in nearly all important museums are their terracotta sarc-

sarcophagi upon whose covers are represented in relief the dead in a half reclining position. Their ornamentation shows a style of mixed Egyptian, Asian and Grecian-archaic motives, which gradually pass into the Hellenistic-Roman series of forms.

VIII. Architecture of the Romans.

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1. General and historical basis.

In comparison to that of the Greeks, the architecture of the Romans developed under essentially different conditions. While the noble nation of the Greeks, self absorbed and satisfied with its location after being once occupied, assumed the fostering care of a beautiful and artistic life, until weakened and disabled in the contests of the races, it submitted to the foreign conquerors, the Romans undertook, after they had scarcely firmly founded their state government, also the subjection of the adjacent peoples, following their innate impulse toward conquest, until at last the most extensive and mightiest world empire had been fused together, that can be described by history. Their prominent warlike characteristics and the model internal structure of the state were the weapons, that ensured these magnificent results to the Romans; those also substantially determined their original relations to art. The Greeks saw in this their highest work, a service well pleasing to the gods; for the Romans this was only one of the many means of expression for the might and the splendor of the Roman state and its members. Therefore architecture lay much nearer to its sense, always directed to the useful and the monumental, than the other formative arts. Thus then suitability, size and showy ornamentation also became the chief characteristics of Roman architecture.

Its development was influenced by the religion in a much higher degree than with the Greeks. This resulted from the opinions of the ancient Italian races, but gradually assumed a tendency allied to one of the Grecian myths. The highest deity is Jupiter, corresponding to the Grecian Zeus; his spouse is Juno. The underworld is ruled by Pluto. Particular veneration was enjoyed by Mars, the god of war, Mercury, the god of commerce, and Vesta (Hestia in Greece) as protectress of the house, the family and the union of the state. In the later period also certain faiths of the subject nations found admission into Rome and wide extension, particularly the Egyptian worship of Isis and the Persian service of Mithras. -- The belief of the Romans in the gods was cold and scarcely intelligible. The Romans revered only the gods; they lacked the ideal-

idealized concrete presentation peculiar to the Greeks. And thereby the importance of the temple for the development of Roman architecture also diminished. But so much the more definitely did they influence the course of historical events.

So long as the Romans remained within the limits of the Italian mainland, in the period of the republic (510 - 146 B.C.), their art was still simple and plain, earnest and strong, a reflection of the unpretentious and hard warlike people. But after (about the middle of the 2nd century B. C.) they had extended their world supremacy over Greece and the distant East, the refined civilization and the luxury of the Hellenistic cities also became naturalized among them, and soon led here to a complete change in customs and to an extravagant love of splendor and magnificence, indeed in a marked degree at the beginning of the imperial period. (31 B. C.). Infinite wealth in art treasures and the noble metals were brought home from the conquered lands to the world city on the Tiber, to be declared the property of the state, or as products of foreign countries to be utilized as commercial goods. The almost unlimited flowing stream of wealth then entered the service of the most luxurious enjoyment of life. Special buildings arose for the numberless use under this and were equipped with the choicest magnificence. An insatiate seeking for show likewise found entrance into the dwelling of the Roman citizen and even covered the simplest utensils of household life with shining glitter.

Like the foreign art, so the foreign artists entered the Roman service, particularly the Greeks. But the Roman in the end showed himself as a receptive and teachable pupil. With surprising skill, he made their technical and form acquisitions his own, especially the Grecian world of forms, so apparent to him. And after he had transferred these to his native soil, he completed this fusion and recoinage, from which proceeded a new and common law of treatment, that dominated in a similar manner the buildings in the Germanic North, as those under the southern sun of the ancient Orient. Thus the Romans finally became instructors in architecture for the entire later world.

II. The structural system.

Grand were the problems with which the Romans approached their architects in the best period, and so admirable and with such technical certainty and solidity were these solved by them and brought to execution, that even the ruins fill us still with wondering astonishment. Their walls defy the weather and storms of thousands of years, owing to the resistance of the materials employed, particularly to the indestructible adhesion of the mortar and the great care in the technical treatment. To make possible the covering of the vast rooms, they took up the voussoir vaulting already practiced to a limited extent by the Egyptians, Babylonians, Assyrians and the Greeks (See pages 15, 26, 28, 94) and carried it to an unexpected development. Thereby they created that grand science of vaulting, that became a model for all times. With equal certainty they treated the other methods of construction, the combination of the architectural members and the erection of intermediate ceilings and the roofs.

For masonry during the republic and the early imperial period, men took for the public buildings quarried stone and ash-lars of the greenish gray peperine (a basaltic tufa stone) and of the yellow travertine (porous limestone). About the end of the republic bricks came into use, which proved to be an excellent material. They were employed both alone as "opus testaceum" with thin bricks 1.18 to 1.97 ins. thick and 7.87 to 11.81 ins. long, mostly deep red, set on strikingly thick mortar beds averaging 1.58 ins. thick, as well as for leveling and bonding courses in rubble stone walls, and particularly in the concrete work (emplecton), so greatly favored by the Romans, whose internal construction they strengthened. The external surfaces were faced with carefully cut ash-lars, in the later period chiefly with marble and stucco, having an effective use and accenting the alternations of bed and end joints. The ash-lar work was animated by drafted margins, bosses and pointing, the plain wall surfaces by "opus incertum", reticulatum and spicatum", i. e., of irregular (uncertain), net-like and herringbone bond. (Fig. 121.

The execution of the vaults followed in a similar manner, ei-

either in cut stone ^r or entirely in brickwork with thick beds of mortar, or also and generally in the mixed construction with concrete and bricks. In this brick arches were set at equal distances and were connected by large flat bricks, so that a strong framework was produced, whose intervals were then filled with concrete composed of mortar and pieces of brick and stone. (Fig. 122). The entire vaulted ceiling ~~thus~~ hardened into a strongly connected mass. (Fig. 164). For the vaulting, the tunnel vault with the curvature of a half cylinder became the simplest and usual form. From it also the most commonly employed expressions for naming the important parts and dimensions of the vaults were transferred to the other kinds, so that for example, the term "abutment" for the wall supporting the vault and resisting its side thrust, "impost" or "starting point" for the base of the vault, "keystone" for the last stone set in the "crown" of the vault, "span" for the distance between the two "springing lines", i.e., the base lines, "front" or "face-wall", for the walls at right angles to the axis of the vault, and more of the like.

From the intersection of two tunnel vaults open at both ends and having equal impost and crown heights, is derived the cross vault, whose ground area for equal spans forms a square. (Fig. 123). The lower surfaces of the vaults then intersect in sharp edges, the "groin lines", at whose bottom the entire pressure of the vault is concentrated, in a manner. Thereby became possible a large opening in the abutment walls and their complete concentration into separate piers. Long rooms were divided into such square areas (bays), which were then covered by cross vaults in rows, by which originated the very effective subdivision of continuous arched porticos.

From the covering of a circular area by a vault uniformly rising was derived the domical vault, that in its regular shape forms a hemisphere and rests on a cylindrical substructure, the drum. (See Pantheon, page 135). Very frequently is this kind of construction found as a niche or apse vault, over semicircular exedras in basilicas, baths etc., and above the great recesses in the walls.

Likewise four, eight, and areas with more sides were covered

by domes, indeed both so that the horizontal section remained polygonal to the vertex (polygonal dome) as well as in the complete round spherical form as a pendentive dome. (As for example in the round vault above the decagon of the so-called temple of Minerva Medica at Rome). Since in the latter case the basal circle of the dome only rests on the middle of the side walls, these must be constructed in the corners for the suspended arched portions a transition to the circular form by corbelled stone courses. This slightly developed construction was replaced in the East Roman art of the late period by vaulted spherical triangles (spandrels, pendentives), a solution that was only to come to complete maturity in Byzantine-Early-Christian art. (Fig. 178).

Vaults chiefly came into use only in public buildings and palaces as the upper termination of the interior. For simple structures as a rule sufficed the flat wooden ceiling of planks on wooden beams, whose undersides remained visible. In the temples are found beside the tunnel vaults and domes the horizontal stone beam and stone slab ceilings with very rich coffers. For the external covering both the one-sided shed roof as well as the gable roof known from Grecian temples, as well as the hip and pyramidal roofs, sloping toward all sides, were in use. To ensure the construction and its durability in certain cases (for example over the vestibule of the Pantheon), even the framework of the roof was of bronze. The covering consisted of clay tiles of very diverse forms, as flat, concave, hip and ridge tiles, and exceptionally of marble or metal plates. The individual development and form treatment of the masses of the building were handled by the Romans with the same certainty as the technical construction. Their structural ground element, the round arch, they made a chief ornamental motive by architectural emphasis and by combination with the colonnade. Thereby they enriched the previously known treasure of forms in architecture in the most fruitful manner.

III. The architectural treatment and decoration.

For the mastery of the great architectural problems of the architectural subdivision of the masses of the buildings proved that the principles of form developed in Hellenistic art no

longer sufficed. The columns could only be employed further on the temples in accordance with their original purpose. On buildings of greater dimensions in several stories they could no longer receive the heavy loads. Therefore they were half or even wholly inserted in the wall in order to transfer to the wall the motive expressed by them. Thus the columns lost their original function and importance. They were treated as structural members for the vertical subdivision of the walls, and so received a predominating ornamental character, that was even strengthened in the later period, when they were set on pedestals (postament) to equalize their heights.(Fig. 126). The horizontal subdivision of the walls resulted by cornices in the form of the Grecian entablature. Over the columns was then required a corresponding projection, an entablature block, around which the section was then returned at right angles. On buildings in several stories were employed (first on the theatre of Marcellus in Rome) all three orders above each other, and indeed corresponding to their historical development and their character, the Doric on the lower story, the Ionic on the second, and the Corinthian on the third. If a fourth story existed, as for example on the Colosseum in Rome, this then received an order of Corinthian pilasters.(Fig. 124). This arrangement later became a permanent rule. The buildings usually received an attic, i.e., an extension above the crowning cornice peculiar to the Roman style, and having the height of about one-third that of the columns below it.(Fig. 146). It equalized the disproportion between the entablature and the height of the building. Likewise in this also appears the assured feeling of the Romans for a good proportion of the members of a building to the whole.

As having very important consequences appeared the combination of the colonnade with the round arch, when the walls were entirely resolved into piers, or partly with engaged columns, and the openings thus produced were spanned by round arches. (Fig. 125). The earliest dateable example of this is presented in Rome by the remains of the Tabularium built in 28 B. C. Yet this new element is already found on steles of Delos and Syros of about 100 B. C. To the round arch was soon given an

enclosure with section moulded like the members of the architrave, the archivolt (face arch), a continuous impost moulding as a springing band.(Fig. 126). Thereby was imparted to the façades the very animated, rich and picturesque effect of the series of arches, the arcade on piers with engaged columns or pilasters. This novel treatment soon became the predominating architectural motive of Roman architecture and in combination with the division into stories and the vaulted construction, the basis of the Roman façade and architectural system. Besides the structural works, it appears to us as the most important acquisition of the Roman architects. But in the architectural and ornamental treatment the details and the decorative equipment with sculptured reliefs and pictured representations, it continues in stronger dependence upon Grecian art. It learned to know this in the Hellenic presentation, already freed from the original severity, and now passed to a wider free use and transformation of the late Grecian series of forms.

The development of the columnar orders leaves to be regretted a penetration into the deeper nature of the columns and into the mystery of their architectural beauty in the Grecian sense. The Doric style, so highly developed by the Greeks, that by its severe restraint would most strongly correspond to the character of the Roman people, found acceptance in but moderate measure. It mostly experienced substantial alterations, until in the new form of the "Tuscan order" it came into the general arrangement.(Fig. 127). This nearly always has a base, even if merely consisting of a plinth with a cove as apophyge, or frequently is also in the form of the Attic base, or as a plinth with torus and fillet. The shaft is never fluted but is usually smooth for its entire height or for the lower third. a neck moulding (astragal) forms the transition to the capital, that consists of necking, echinus and abacus. The echinus as a rule is profiled as a greater round (in a quadrant), but also frequently as a cyma. The abacus bears a crowning member. The entablature has a low architrave, at first plain, later in two or three fascias, and a high frieze (see lower cornice of Fig. 126 in Fig. 127), on which the angle triglyph is set back over the axis of the outer column, so that a half metope resu-

results outside. The triglyphs are frequently omitted. In the main cornices of certain earlier buildings (for example, on the theatre of Marcellus), a dentil band is inserted over the triglyphs. (Fig. 125).

The Roman-Ionic order adheres to the Grecian model in general, even if its classical purity in treatment be not attempted. The volute bolster on the capital was formed by a horizontal band without the depression at the middle. (Fig. 128). The volute lines no longer remain in the plane but turn outward. For a peripteral positions the diagonal capital (Fig. 79) was preferred. The entablature has a comparatively low architrave and frieze, but corresponds in details to that of the Grecian-Ionic with somewhat heavier sections.

The Corinthian order occupies the preferred position among the splendor loving Romans. The proportions of its column are the same as in the Grecian order. The shaft generally remains smooth for the nobler materials, and especially for those of dark color; for light stone it receives 24 flutes, ending in semicircles above and below, or even horizontally (in Pompeii and Tivoli), in their lower third flat cables (rounds) being frequently inserted. The shafts not seldom have spiral flutes, decorated by scales, foliage, or even mosaics. The capital is somewhat higher than the Grecian. It exhibits a delicately designed treatment; from two rows with eight acanthus leaves in each spring eight flowers with two scrolls each, that unite in pairs beneath the angles and at the middle, support the abacus and thus express the static function in a very animated way. (Fig. 129 a). Corresponding to the treatment of the capital, the architrave is also more richly decorated by ornamental members, the fascias not seldom having continuous fret or scroll bands and with sunken panels on the underside. The frieze receives sculptured figures in relief or festoons of fruits. (Fig. 130). The Romans treated the cornice in a manner unsurpassed in richness and beauty of effect. The widely projecting geison rests on a continued series of elegant modillions, recurved in the forms of doubled volutes and luxuriously decorated. Since then the visible intervals between the modillions receive recessed coffers, such a main cornice therefore

appears as a crowning of exquisite beauty, when seen from below. (Fig. 131).

In the imperial period originated a variety of the Corinthian capital by its combination with the Ionic diagonal capital, so that an Ionic capital was placed on the Corinthian bell, when the volutes either grow out of the interior (arch of Titus) or are joined by a narrow horizontal band (arch of Septimius Severus in Rome). This Composite capital (Fig. 132) is first found on the arch of Titus in Rome, built 81 - 96 A. D. It appears as a scarcely happy creation, that has sacrificed just the most effective part of the Corinthian capital, the flower stalks with the elastically springing scrolls, in favor of an inorganic innovation. But the Roman art of the later period also matured other forms of the capitals of columns, the so-called fanciful capitals with very free added plant motives, a animal and human figures and the like. (Fig. 129 b). Men chiefly preferred to furnish the pier and the pilaster with such unrestricted ornamental forms. Otherwise to them and to the entablatures in all Roman orders were given the same proportions in height and the same bases, sections and forms of capitals as to the corresponding columns. In the treatment of the details of the Corinthian order Roman art rises to a splendid, luxuriant and frequently showy magnificence. All members of the base, of the capital and the cornice were finally adorned in the richest manner with architectural decorative forms (pearl, leaf and egg beads etc.) and with ornamental work.

Concerning the polychromy of the architecture, so far as this was not produced by the use of stone of many colors, we only have direct information in regard to the structural parts covered with stucco, which were always painted in animated colors. Of the facades constructed of marble, so far as this may be determined from existing remains, only the sculptured architectural members and ornaments received a decorative completion by colored treatment.

The external columnar architecture likewise forms the basis for the decoration of the interiors. In the greater monumental buildings the wall surfaces were subdivided by columns and pilasters. (Fig. 133), and were animated by niches, which like

the windows and doorways, when spanned by a round arch received an archivolt with impostes and keystone, or when of rectangular form, a moulded architrave, pilasters or columns with a horizontal, ~~arched~~ or angular pediment. (Figs. 134 and see 120).

//3 The intermediate mural surfaces were divided into spaces by horizontal and vertical bands, with again recessed panels in darker colors. By a corresponding contrasting treatment of the series of columns and pilasters and of the cornices in white or light colors (the **bases**, capitals, architraves and cornices in white or light colors, the shafts of the columns and pilasters in deeper and stronger tones, the friezes in very dark colors) was attained a great clarity and united effect. For the most prominent buildings the material consisted of a genuine marble facing, where the walls were covered with marble slabs fixed with cramps, set with mortar at the back and then polished, a procedure that had already reached high perfection in the Alexandrine period. The pavements were laid with marble slabs or mosaic, that in the earlier time consisted of small cubes of stone of many colors (*opus tessellatum*), but in the imperial period also frequently were inlays of thin slabs, cut into the forms of a drawing (*opus sectile*). By the decoration of the vaults we see how accurately the Romans understood the development of their bold construction into an artistic form and to enhance the effect of vast space. They divided the surfaces into square, rectangular, lozenge and polygonal coffers, diminished correspondingly upward in the dome, which were deeply sunk, richly enclosed by pearl, egg and leaf mouldings and with grounds ornamented by a suspended rosette in relief. (Fig. 135). Thereby they not only actually reduced the weight of the vault, but also gave it the appearance of a light and elegant ceiling, which spanned the great hall like a network (Figs. 133, 140, 160). For less richly treated architectural works and in smaller rooms, there occurred instead of the marble facing an imitation in stucco and painting, from which proceeded the charming (Pompeian) style of decoration to be described later.

Decorative sculpture acquires on Roman buildings a richer field of application in the crowning statues, friezes, atlantes,

caryatids and the like, but does not advance beyond a direct imitation of Grecian art works and conventionalization in the Hellenistic sense. Very beautiful are certain historical reliefs (for example, on the arch of Titus the bearing of the booty from the sanctuaries of Palestine, Fig. 136), and the mythological figures, geniuses, nymphs, soldiers and the like, modeled freehand in stucco, such as have still remained in the Stabian Baths of Pompeii and in antique tombs on Via Latina near Rome.

Decorative painting likewise remains dependent in style upon Grecian art. In the so-called scenography (perspective), the painting of plane walls with architectural and figure representations, it attains to excellent works, that we can best follow in Pompeii. (Fig. 150).

In Roman ornament the acanthus forms the basis, yet conventionalized differently from Grecian foliage. On the Corinthian capitals of the best period (vestibule of the Pantheon), it exhibits a palm leaf arrangement with a spoon-shaped rounding of the leaves. (Fig. 137). Otherwise the connection with projecting scrolls in order to arrange the acanthus leaves in overlapping form with luxuriant and soft modeling is characteristic of Roman ornament. (Fig. 138). To this are added conventionalized animal and human forms, fruit and lower festoons with bands, skulls of sacrificed animals, tools and weapons, and finally quite naturally treated plant motives, branches of the plane and cherry trees, vine leaves and branches, etc. From the overlaying or repetition of these elements originated grotesques,* the distinctive mixed ornaments of the Roman antique
 115 composed of wonderful ("grotesque") human and animal forms with scrolls and foliage, that finally (as the so-called "infinite repetition") overran entire surfaces in symmetrical arrangement, and became the direct prototype for the periods of Saracenic art, so fruitful in the domain of ornamentation, the high and late Renaissance and the Barocco period. The employment and detailed development of Roman ornament misses the refined feeling for form in accordance with the functions of the architectural members found in the carefully judging Grecian art spirit. In the entire treatment is manifested a free conception, regarding the ornament chiefly in itself as a decora-

decorative accessory, wherefore also many architectural works, especially in the later time, even if calculated for a rich effect, produce a massive, heavy and overloaded impression by the often actually inorganic decoration of nearly all structural members. The importance of Roman architecture is indeed but slightly influenced thereby. For not in details lies its strength, but in the mighty technical works in regard to their creation of colossal interiors, in the great monumental tendency, with which in the treatment of facades and internal decoration it masters the masses, and particularly in the model plans of the types of buildings created by it. *

** The name of "grotesque" appeared at the end of the 15 th century for the antique wall and ceiling paintings then discovered in subterranean chambers (grottos). The Renaissance masters (particularly Raphael Santi among them) were so enraptured by their freshness and charm, that this mode of ornamentation led to a new conception in the art of the Renaissance. (See volume 2).*

IV. The monuments.

For several centuries the temple stood among the Romans in the foreground of architectural activity. But in general it formed but a small part of the problems, that were proposed to architecture by the powerful Roman citizens, soon acquiring independence and wealth. By the prominent participation of the entire people in the politics of the world empire, public life was spent to a greater extent than in the Hellenistic cities, in the market place and the forum, which consequently was transformed into a magnificent design in the grandest style. For the developed commerce and the courts the erection of the basilica became necessary, and in order to satisfy the strong claims of the people to public enjoyment, those of the theatre, amphitheatre and circus. For recreation and the care of the body served particularly the public baths or thermes, in which the Romans beheld such indispensable designs, that also everywhere that they settled, care was first taken for their establishment. Then in the best period arose the triumphal arches as magnificent gateways in honor of the entering victorious generals and the memorial columns. Secular architecture shone

in the stately imperial palaces and villas, and the Roman dwelling received its artistic development. But even the tombs afford interest to the history of architecture, as well as the utilitarian structures, in which the Romans completed astonishing undertakings. The entire plans and treatment of the architectural works shows in the tendency toward the grand and monumental, in the free conception and the rich and varied forms, the basal character of the people, that conquered and ruled the world.

The Roman temple is derived in general from a combination of the Etruscan ground plan with Grecian architectural forms. But its entire development is treated somewhat more freely than that of the Grecian temple. The ancient Italian form determines the earlier monuments, and which is similar to the Grecian prostyle temple, consisting of a deep vestibule with a single cell on a high podium, which is also retained for the later buildings in order to enhance the effect. (Figs. 139, 140). To the podium leads on the facade a wide flight of steps flanked by side walls. The peristyle is generally only indicated by half columns on the external walls of the cell. (Fig. 166). In the interior in case of richer treatment, the walls are animated by alternately rectangular and semicircular niches accompanied by columns or pilasters and crowned by caps, so that an extremely showy internal architecture is produced. A particularly large recess (exedra) is intended for the statue of the deity. The covering of the cell substantially differs from that of the Grecian temple, in that instead of the horizontal ceiling occurs a coffered tunnel vault (double temple of Venus and Roma in Rome), but the Grecian pediment was still retained on the exterior. In the later times are found nearly all kinds of temples, even peripteral. Especially characteristic is the preference expressed for the circular temple, both that with horizontal ceiling as well as with domical vault. The Pantheon at Rome is the most famous example.

Public secular architecture obtained its opportunity by the ground planning and architectural development of the cities. For this, among the rich Hellenistic cities the magnificent plan of Alexandria chiefly appears to have served the Romans

as a model. Not only were the commercial and sanitary conditions cared for in the best manner, but likewise a very wide scope was allowed to purely artistic considerations. These originated entire magnificent streets with porticos extending along both sides, but which were again effectively interrupted by certain projecting buildings and picturesquely animated by arched gateways and memorial columns. But the chief attention was always devoted to the forum, the market place corresponding to the Grecian agora, as the centre of the commerce of the city and the public life, the scene of political transactions and of the sittings of the consultations of the great assemblies of the people. Each city had at least one forum. There were placed the most important buildings. The Forum Romanum was the oldest and most noteworthy in Rome; from its rostrum (rostra, the public platform of orators) the Roman people was formerly inspired to great deeds; Caesar and Augustus beautified it by splendid buildings. (Figs. 141, 142). But also the other forums were richly and in part showily treated. The forum of Trajan was esteemed a wonder of the world. -- A clear representation of such a design in a smaller city is still given by the ruins of the principal forum of Pompeii.

Among the secular buildings erected on the forum, the basilicas occupy the most important place. They were already known in the Grecian period as places for courts and officials (stoa basileos = royal portico), had in Rome no strictly limited purpose, but chiefly served for the proper market traffic and the administration of justice. Its ground plan (Figs. 141, 162) has the form of an elongated rectangle, which contains a middle room of similar form, the middle aisle; this is surrounded by single or double porticos, the side aisles. At one end is found the entrance treated as a portico, opposite it at the other end being usually a semicircular addition, termed apse, as a raised platform for the court of justice and enclosed by marble railings. The side aisles were frequently two story, the middle aisle being made high. If the rafters were not left visible, the ceiling was composed of a coffered wooden ceiling, more rarely vaulted. The forensic (judicial) basilicas of the later period frequently differ from the normal design,

but always exhibit the ground scheme of the three aisled principal room with one or more tribuness. The oldest and a well preserved example of this very important form of building is the basilica on the chief forum of Pompeii, dating from the second century with a three aisled main apartment and a rectangular tribune. In the imperial period even the larger palaces had their own basilicas. (Fig. 152).

118 The Roman theatre was imitated from the Grecian (see page 93),
 119 but is not sunk into the ground, since it is treated as a detached structure, so that a tall architecture in several stories was required for the exterior. Instead of being in the orchestra, the drama was performed on an elevated stage (pulpitum). For this the Grecian proscenion received a corresponding extension toward the orchestra. The parascenions could be removed. The side entrances (paradoi) were built over, above them being arranged the preferred boxes (corresponding to the proscenium boxes of the modern theatre), and which were then placed against the stage building. Thereby originated an enclosed plan, that has been retained until the present day as the ground form of theatre buildings. The first stone theatre at Rome was that of Pompeius of the year 55 B. C., the best known being that of Marcellus of the year 11 B. C.

For producing hunts of animals and combats of gladiators, the stage could be removed. By the great crowding of the people to such shows, there soon resulted the need for utilizing for the spectators the side previously occupied by the stage. Thus originated the generally complete elliptical enclosure of the amphitheatre, in which the orchestra became the arena or place for combats, surrounded by the rows of spectators rising around it. A well preserved amphitheatre, at the same time proved to be the earliest, is that at Pompeii, (Fig. 143), built about 70 B. C., but the grandest design is that of the Flavian "Colosseum" in Rome, completed in the year 80 A. D., (Fig. 144), whose external dimensions amount to 616.8 and 511.8 ft., in the arena being 252.6 and 152.6 ft., so that over 50,000 spectators could find places. The height of the external wall measured 168.8 ft. Even today in its ruins, this grand structure makes a truly overpowering impression.

The Roman circus corresponded to the Grecian hippodrome. It was a structural design for races in chariots and on horseback, consisting of a very long and narrow race course, the arena (that of the Circus maximus must have been 1952.2 ft. long and 360.9 ft. wide) and the space for the spectators rising like an amphitheatre and frequently enclosed by a portico (at the Circus maximus were apparently 260,000 seats). In the middle of the arena extended lengthwise a raised parapet (spina), crowned by statues and obelisks; at each end stood a conical stone goal (meta). The portal for the entrance of those taking part in the contests was found at one of the two ends; the opposite one ended in a semicircle. Here was the porta triumphalis leading through the space for spectators and intended for the festal exit of the victor. -- At the end of the republic the Grecian stadeion and odeion found entrance into Rome.

The Baths (thermae) were developed gradually from the bathing arrangements connected with the gymnasiums after the Grecian model into magnificent and luxurious buildings in the grandest style, which were both intended for the care of the body and for instruction, and also for the intellectual and artistic enjoyments of the most select kind. As essential parts they contained (Fig. 145):-- the vestibule (lobby V), a room for removing the clothing (apodyterium), the cold bath (frigidarium) with swimming basin (natatio), the lukewarm bath or warm air room (tepidarium), the hot or warm bath (caldarium) with the cold water basin (labrum), the sweat bath (laconicum, 7) as a small and generally circular room filled with hot and dry air, the anointing room (unctorium) and the palaestra, the court surrounded by porticos and for gymnastic exercises, especially for the ball games before the bath, so dear to the Romans. The plan regularly exhibits an arrangement of the principal rooms successively on the shorter axis of the bath building, first the cold bath, then the warm bath in the middle of the structure, and behind this the hot bath. The heating was done by the hypocaust, a heating chamber under the floor, from which hot air flues led to the hollow walls of the hot and warm baths. -- These bath structures lay in a spacious court with areas for exercise and games, adorned by plants and waterworks, surrounded by porticos with promenades, lecture halls, exedrae

and galleries for paintings and sculptures in part of the highest value. The clearest representation of the baths, usually existing in very great numbers, is given in Pompeii by the baths erected in about the 2nd century B. C. on Stabian and Abundance streets, in Rome by those of Caracalla on Voa Appia, completed in the year 216 A. D. (Fig. 145).

The triumphal arches come from the primitive tendency of the Roman people to create for its great deeds and those of its generals prominent monumental memorials. They belong to the most important and artistically perfect works of the Romans. Their form is determined by the purpose of treating state gateways as artistic enclosures of a high and wide gate, spanned by a richly coffered tunnel vault and usually with two smaller side passages. The facades receive a single or doubled colonnade on a continuous plinth or pedestals, a splendidly treated cornice and a high attic with the dedicatory inscription. Projecting columns are crowned by capitals, the frieze, arch spandrels and panels are adorned by rich sculptures, whose meaning relates to the deeds of the victor. There also exist numerous similar triumphal arches in the other provinces of the world empire, but those best known in Rome are those of Titus (Fig. 146), of Septimus Sewerus (Fig. 163) and of Constantine the Great.

The honorary (memorial) columns likewise have the problem of supporting honorary statues, particularly those of the emperor, as well as by cowering the shaft with a slowly rising and continuous band of reliefs, to present the largest possible surface for connected historical representations. (The relief band, 3.28 ft. wide, 656.2 ft. long and developed in 22 turns, of the column of Trajan in Rome, Fig. 147, treats of the two campaigns of the emperor against the Dacians, and it has 2500 figures from 1.97 to 2.30 ft. high, with a careful rendering of racial characteristics, costumes and weapons of the different peoples, thereby being a document of high value.).

The excavations in Pompeii afford to us most important conclusions regarding private architecture. The Roman dwelling very substantially differs from our modern houses, because as in Greece, its entire beauty is internal, while the exterior

entirely lacks the development of the facade. Only in streets for traffic do shops and workshops open externally. All the principal rooms lie on the ground level, whereby a great extent of area is required, especially in depth. Where an upper story existed, only subordinate rooms were placed in it, at most but a dining room (cenaculum). We find the ground plan in the Etruscan dwelling (see page 100). From the 2nd century onward, there occurred an extension and enrichment under the influence of Hellenistic art and mode of life. The representation of the men's and women's dwelling found no admission among the Romans. The atrium and the tablinum remained as before the chief portions of the house. Likewise the other rooms grouped around the atrium were retained. But behind the tablinum was placed a court with porticos, the peristyle, after the Grecian model (see page 96), treated in its inner open space as an ornamental garden (hortus) (Fig. 148) and surrounded by rooms, that received the Grecian names of Oecus (festal hall, exedra (conversation hall) and triclinium (dining hall). A narrow passage beside the tablinum, which the Romans termed "andron", connected the peristyle and the atrium. The tablinum also opened toward the peristyle in its entire width or by a wide doorway: The atrium itself was generally enlarged. In its original and simplest construction, the Tuscan atrium, the ceiling was supported by four intersecting beams, that left the compluvium free between them. But with the ever increasing dimensions, support soon became necessary, at first by four columns and later by a greater number, so that also the atrium was surrounded by porticos. Thus originated the tetrastyle and the Corinthian atrium. The surfaces of the roof were inclined inward to the compluvium; the falling rain water was collected in the impluvium, that in the better houses was enclosed and bordered with marble. For the displuviatile atrium the roof surfaces did not slope inward, but outward and toward the enclosing walls; the light opening then occurred on high at the ridge of the roof. Smaller atriums were sometimes entirely covered by a hip roof without the compluvium (atrium testudinatum). The entire plan of the dwelling permits the recognition of a **division** into two main portions, a front house (an-

(antica) with the plan of the Italian atrium house, and a rear house (postica) after the model of the Grecian peristyle house (Fig. 149). The atrium and the front rooms in the later period chiefly served the master for his business purposes, while the peristyle building remained ever more reserved for the proper family life. The connection of the two divisions was moreover chiefly effected by the andron and also through the tablinum, which received particular treatment as the reception room of the master.

The construction of the Pompeian dwellings entirely occurred in rubble masonry, both as opus incertum and as opus reticulatum with the use of lava, tufa and limestone (travertine). Bricks were only found at the angles, door jambs and columns, when these were not composed of the stone mentioned. In the imperial period also the white Carrara marble found employment for columns, pilasters and cornices, and the variegated in slabs for floors and facing walls. Otherwise the internal walls were covered by a coating of stucco 1.97 - 3.15 inches thick and then furnished with animated painted decorations. Those in great part well preserved Pompeian decorations are most interesting to us for the history of art. But they also have such an individual and intimate charm, that we now still pay to them our entire admiration. The procedure throughout appears, as fresco; the bits of marble were prepared as mortar, applied in three coats, and the last layer was made as fine as possible and already mixed with the ground tint. Hence occurred, so long as the plaster remained damp (al fresco), the painting on it with colors intimately mixed with Punic wax. This appropriate technical procedure explains the great durability of Pompeian mural paintings; on it is also based the predominance of distinct colors on large panels, and the basal harmony thereby required. The evolution of the ornamentation permits the recognition of four distinguishable styles, that not only prevailed in Pompeii, but also in Rome at about the same time. The first so-called "incrustation style" (3rd and 2nd centuries B. C.) is characterized as a direct imitation of marble facing by a covering of stucco in relief. In the second style, the so-called "architectural style" (in Rome from 100 B. C.,

in Pompeii from about 90 B. C.) the marble facing was likewise imitated, not in stucco, but by painted representations of architectural forms, as those might be in reality. In the panels are inserted paintings of figures and landscapes. About the Christian era began the "third ornamental or Egyptian style", in which the wall was regarded as an unbroken surface and decorated by ornamental paintings, in which were employed numerous elements derived from Egypt, indeed in beautiful, noble forms and delicate and finely graduated colors. If architectural motives occur in this style, they are purely ornamental and are treated so gracefully and flatly, that they could not be taken for the reality. The fourth and properly "Pompeian style" from the late times of Pompeii (about from 50 to 79 A. D.) resolves the walls into a sportively slight, perspective, but always conceived as decorative, sham architecture (Fig. 150), with views of fanciful porticos animated by figures and soaring geniuses or idyllic landscapes, all in deep and brilliant colors of great richness. By these paintings, which we must count among the most magnificent creations of antique art, the Pompeian house, so tasteless and plain externally, received an extremely attractive and harmonious interior; the already effective architectural as well as tasteful effect of the perspectives, especially from the atrium to the peristyle (Fig. 151), thereby experience still a considerable enhancement.

More simply that the house of the well to do Roman citizen was treated than that of the less wealthy man, even if on the same ground lines (in Rome were even barracks for rental, which piled up so many stories, that finally a legal limit was fixed for their extreme height). But on the other hand, also the houses of the rich and the great were the more extended in plan and luxuriousness in the equipment. The imperial villas of the first period in general borrowed their ground plans from that of the citizen's dwelling with a mode of execution corresponding to the dignity of the occupant. The vestibules became princely anterooms, the atriums were high and spacious columnar courts, the peristyles great garden designs with walks, adjacent collections of books and paintings, and even with basilicas for the official business of the emperor. With the inc-

increasing pretensions to holding a court must the enclosing of the plan ever yield to a more open structure on the site and a thorough regard to surrounding nature. The porticos and windows opened sometimes into the open air or on well kept gardens. The natural elevations of the ground were utilized as effectively graded terraces. Baths were found in nearly all villas, but in the largest were also theatres and stadiums. -- Of the numerous structures of the kind but few ruins now remain, the best preserved being at Albano and Tivoli, the latter being especially interesting, since there the art-loving and widely traveled emperor Hadrian had the most famous architectural buildings of the ancient world reproduced at a smaller scale for his summer residence.

Among the imperial palaces, that commenced by Augustus in the midst of the Palatine at Rome and extended in plan by the Flavians, formed a palace or proper residence of the emperor. The ground plan (Fig. 152) permits the recognition of the sequence usual in the Pompeian house of enclosed rooms and open courts in a symmetrical arrangement, indeed at a disproportionately great scale. The narrow main facade at the north is preceded by an open portico with piers, from which three doorways open into the palace, the right one into a basilica, the left into the lararium (palace chapel), and the middle one into a reception hall very effectively treated architecturally by niches and colonnades, 98.4×128.0 ft. Behind this lies a colossal columnar court 190.3×173.9 ft., adjoining which on the right (northwest), and probably on the not yet excavated left side, is a series of rectangular and octagonal rooms with semicircular exedras. The termination at the southwest end is formed by a great hall, generally designated a triclinium, 100.1×111.6 ft., with a segmental niche on the main axis. Through the doorways and windows in the northwest wall the view opens into a nymphaeum constructed in an adjoining room at the side, a grotto structure with fountains etc. In the subdivision of the interior appears the endeavor to animate and extend the rectangular plan by the arrangement of niches and circular rooms. With the corresponding vaulting then originated those relations between the ground form and the shape of the ceiling,

on which is based the unified and decided effect internally of Roman architectural structures.

The remaining imperial palaces are freer in plan, in part entirely developed independent of the sequence of rooms in the Roman dwelling. The palace of Diocletian at Spalato has the unusual form of a fortified structure arranged on a colossal area 649.6×518.3 ft., that is defended by 16 towers, and like a Roman camp, is divided into four quarters by two intersecting streets, and in which the separate apartments are grouped around a peristyle.

The internal ornamentation developed in these imperial palaces is an ostentation previously unknown, that in certain cases, as for example in the golden house of Nero (domus aurea) was carried to the extreme limit then possible.

As among the dwellings of the living, so likewise in the tombs was the place of repose of the emperor distinguished above the rest by its magnitude and rich architectural treatment. The mausoleum of Augustus was planned in the year 28 B. C., in which the members of his family and an entire series of later emperors were buried, had the Etruscan form of a tumulus tomb, consisting of a high circular substructure 311.7 ft. in diameter, on which was raised the mighty earthen mound planted with cypresses, at the apex of which stood the colossal statue of the emperor. The external wall was subdivided by deep niches with half domes, a columnar portico being placed before the entrance. Even more imposing was the mausoleum of Hadrian (built 136 - 139 A. D.), preserved in the castel of S. Angelo. It had a similar ground form. But the drum enclosing the sepulchral chamber rose above a substructure 341.2 ft. square, was 239.5 ft. in diameter, and was faced with marble and crowned by a rich entablature with a series of statues, behind which then rose the cone, whose apex was occupied by a statue of the emperor. In the other tombs are found nearly all modes of burial, that the Romans had learned from the peoples conquered by them: - rock-cut tombs after Etruscan traditions (tombs of Scipio and of Naso near Rome), rows of tombs in walled burial places with locations for cremation (ustrina) tombs, fountains, and simple marble memorial columns, the stones similar to the

erect stiles; columbariums as subterranean vaulted tombs with niches arranged above each other in the walls for preserving the urns of ashes; later when the cremation of corpses was abandoned (from the 2nd century A. D. onward), sarcophaguses, that were partly placed in pits and partly in the open air; altars on terraced substructures, in which were placed the sepulchral chambers (particularly common in Pompeii); small structures like temples of varied forms; tumulus tombs with a high cylindrical substructure (tomb of *Cecilia Metella* on Via Appia) in some cases even pyramids as imitations of Egyptian royal tombs (pyramid of *Mestius* in Rome). These tombs found places outside the city gates and along both sides of the country roads. In Rome the Via Appia and Via Latina are the more prominent necropolises. A well preserved and harmonious view of such is still presented by the street of tombs before the gate of Hercules at Pompeii. (Fig. 153).

Just as in the already mentioned structures and monuments, the Romans also showed themselves in purely utilitarian buildings as masters with the spirit for great undertakings and with the highest technical abilities. They not only executed them from the first as solid as if they were possibly intended for eternal duration, but they generally gave to them a monumental and frequently artistic character. To provide a good water supply for the baths and innumerable fountains were constructed aqueducts of extent previously unknown. At the beginning of the imperial period the city of Rome already had nine supply channels with the immense length of 270.9 miles, with 14.9 miles of tunnels and 39.8 miles of aqueducts. Later were added five others. Most are now merely ruins, which for miles in length intersect the quiet campagna by unusually picturesque arcades. (Fig. 154). But four of them still as formerly bring fresh spring water into the eternal city, and they alone make Rome the richest city in water in the world. At the intersections with the streets the aqueducts were carried across by architecturally treated gateways (Porta maggiore on the Aqua Claudia). The distribution occurred by means of wisely arranged water houses. The ends of the aqueducts were treated as monumental spring and fountain houses, and as show fountains, the so-called nymphaeums.

Likewise the best care was taken for the drainage of the city by numerous subterranean sewers, of which the mighty and beautifully vaulted Cloaca maxima presents the most famous example. It was formerly ascribed to the Etruscans but according to recent investigations, it dates from the early imperial period, at least in its present condition.

Of the former city walls, there still remain those of Aurelian (built 270 - 276 A. D.), although their construction no longer attains to the solidity of the earlier buildings.

Likewise outside in the distant provinces of the colossal empire have remained numerous Roman buildings as gates (Porta Nigra in Treves), Bridges (Fig. 155), aqueducts (Pont du Gard near Nimes) and paved roads. Along the northeast frontier extended the Wall, that Roman frontier wall, composed of an earthen embankment, ditch, and partly also of palisades, defended by castles, which was built under Domitian and the later emperors.

V. Historical evolution and Monuments.

If one surveys the course of evolution in construction and form of Roman architecture, then are four periods clearly recognizable.

1. From 510 to 146 B. C. the early republican period, the epoch of ancient Italian, Etruscan and early Grecian art, chiefly practiced by Etruscan masters in simple and plain forms.

2. From 146 to 31 B. C. the period of Roman conquests in southern Italy, Greece, Egypt and Asia Minor, characterized by the penetration and advance of foreign elements, particularly of the Hellenistic series of forms and the transition to the Roman architecture. In both periods the materials consist of peperino, travertine and airdried bricks with a covering of stucco and terra cotta.

3. From 31 B. C. to 138 A. D. the best period of the Roman world supremacy of Augustus and his successors until the death of Hadrian, i.e., the period of perfected Greco-Roman style with the use of marble and stone of many colors in the most careful construction and with the noblest treatment of forms.

4. From 138 to 337 A. D. the period of the decadent empire and of decay, characterized by the use of the most costly mat-

materials, the increased ornamentation, excessive use of mouldings, overloading with ornamental work, neglect of care in construction and the treatment of details, and finally complete degeneration and decay.

13/. In the first period is Roman architecture chiefly dependent upon Etruscan until late in the third century. The temples in great part had the "Tuscan plan", for example that of the Capitoline Jupiter at Rome (see page 101), and even then the masonry construction was adopted from the Etruscan. Yet there also appeared in certain cases the influence of the art of the southern Grecian provinces in Italy. A temple recently discovered in Conca near Rome, whose erection must fall in the 5th century B. C. has in plan and in the stepped substructure entirely the Etruscan characteristics. (Elongated cell, pronaos, opisthodomos, and portico on the front and sides with 4×9 columns). About the end of the 1st century in an independent way the Roman spirit, always directed toward the practical and useful, expressed itself in numerous utilitarian structures, bridges, roads and aqueducts. The temple always received a Grecian cell, a high podium, spacious front portico with closely set columns after the Grecian pattern, side porticos and Etruscan rear wall.

In the 3rd and 2nd centuries became apparent a stronger influence of the Etruscan-Greek influence, especially from Asia Minor. Rome engaged in animated commerce with the kingdom of Pergamon. The Hellenistic architecture represented there by Hermogenes (see page 91) was transferred to some Ionic temples in Rome, to the Mater Matuta, called Fortuna Virilis on the forum Boarium in Rome (Fig. 139, 140) of the year 212 and that of Juno Sospita of the year 197 B. C. But at the same time the Corinthian style found acceptance on the Temple of Magna Mater on the Palatine from the year 191 B. C., and the charming round temple in Tivoli from the middle of the 2nd century (Fig. 156), where the slight diminution in the lower third of the shafts of its columns is striking. From the beginning of the 2nd century likewise date the first market halls, the basilicas, as the earliest basilica Porcia, erected in the year 184 by M. Porcius Cato after his return from Greece,

and the basilica Fulvia of the year 179 B. C.

In the second period Grecian influences obtained supremacy. The courts were enclosed by porticos and animated by statues, the temple itself being adorned by mosaic floors after Grecian models and with gilded ceilings. For the building of the two
 132 temples of Jupiter and of Juno on the Field of Mars, Hermodorus was called from Cyprus (after 146 B. C.). He erected in them the first great marble buildings of Rome, whose prominent magnificence contributed so much to the Hellenizing of Roman architecture. About the end of the century was built the beautiful round temple, the so-called temple of Vesta near the Tiber, a nobly treated peripteral temple of 20 marble columns with a small round cell.

About in the year 80 B. C. set in a strong impulse in the architectural activity of Rome, and thenceforth Roman architecture bears its individual characteristics. By the addition of the system of columns in the form of half columns with the corresponding entablature, the walls received an architectural subdivision with a definite sequence of the three columnar orders in buildings of several stories. The arch entered into close connection with columnar architecture. There originated the Tabularium as the archives of the state, a monumental structure of high importance to the history of art, (see Figs. 141, 142) at the base of the Capitol; further on Via Appia the tomb of Cecilia Metella, well known for its frieze of ox skulls with garlands, the basilica Aemilia on the Forum on the site of the ancient basilica Fulvia, and the splendid basilica Julia with five-aisled interior, erected about the middle of the first century on the southwest side of the Forum by Julius Caesar with the vast dimensions of 331.3×160.8 ft., constructed of marble, and the new forum of Caesar on the northeast side. (See pages 118, 119). The circus Maximus was rebuilt with greater magnificence. Outside Rome is notable the beautiful temple of Hercules at Cori with an approximately square front portico of four Doric columns in front, (sole example of the Doric order in Roman temple architecture and indeed in the latest Hellenistic treatment of form) and with wall piers on the exterior of the cell wall. It dates from the time of Sulla, who

also transformed (in the year 80 B. C.) Pompeii into a Roman colony. The temple of Apollo there (Fig. 157) is further a Hellenistic creation as a peripteral Corinthian temple with podium, without termination by a rear wall, but with a front portico; it lies in a court, that was surrounded by a two story portico.

In the third period from Augustus until the last year of the reign of Hadrian (31 B. C. - 138 A. D.), Roman architecture moves in an ascending line. Rome received a new expression; "from the city of clay arose one of marble." An inconceivable love of building was the character of the entire time. Augustus must have restored 80 earlier temples in the first years of his reign, have completed 20 other buildings and have erected 40 new temples and public buildings. He enlarged the Roman Forum, caused to be rebuilt on it the temple of the Dioscuri (Jupiter and Pollux) (Fig. 158) and the temple of Concord, and he erected the little temple of Caesar with the rostrum (rostra Julia) placed before it. Furthermore Augustus placed beside the forum of Caesar his own, the forum of Augustus, with the great temple of Mars Ultor (avenging god of war), of which there yet stands 18 tall columns with Roman Corinthian capitals, a portion of the ceiling and front portico in the noblest construction of Carrara marble. Augustus also completed the theatre of Marcellus already begun by Caesar, built on the Palatine the temple of Apollo and the palace as an imperial residence, (see page 127), and finally on the Field of Mars his mighty round tomb, the mausoleum of Augustus.

Under Augustus and by his son-in-law and colleague was erected the (old) Pantheon (in the year 27 B. C.), that indeed formed the main hall of the baths named after him, the first design for public baths in Rome executed after the Grecian model; further the basilica of Neptune, of which 11 columns 42.7 ft. high and of noble form still stand. This classical early imperial period, that indicates the golden age of Roman art and literature, is characterized in style by the predominance of the Corinthian order, usually with a high base for the column and shafts frequently without flutes, matured Roman Corinthian capitals, low architrave, relatively high frieze and rich cor-

cornice with modillions. The best known architect is Vitruvius Pollio, military architect of Augustus. He issued in 16 B. C. ten books on architecture representing chiefly the principles of the Hellenist Hermogenes, was esteemed as the lawgiver of architecture, and thus exercised such a great influence on its evolution.

The direct successors of Augustus 14 - 69 A. D. also in the fostering of architecture entered into the inheritance of their great predecessor. On the Roman Forum was rebuilt the temple of Saturn, of which 8 columns yet stand, but whose ~~Tonican~~ diagonal capitals date from a restoration in a later period. To the palace structures on the Palatine were also added the palace of Tiberius and that of Caligula. Claudius built the aqueduct Claudia, and Nero his "golden house".

The Flavians proceeded with monumental buildings in the grand style (69 - 96 A. D.). The astonishing though depreciated "golden house" of Nero was torn down and in its place were built the great baths of Titus and the Flavian Amphitheatre, cal-golosseum, a masterly undertaking in regard to suitability in ground plan, construction and architectural treatment. Vespasian and Titus laid out the forum of Peace (also called forum of Vespasian) and built therein the great temple of Peace (templum pacis). The senate and people dedicated to Titus after his death (81 A.D.) the beautiful triumphal arch at the base of the Palatine (Fig. 146) in memory of his world historical conquest of the Jews (70 A. D.) and the destruction of Jerusalem. Domitian (81 - 96) erected the temple of Vespasian, of which 3 columns still stand upright, and whose frieze bears an interesting ornamentation (Fig. 159). There further dates from him the splendid imperial palace on the Palatine, already commenced by Augustus; he also began the erection of the forum transitorium as a connection between the forum of Peace and that of Augustus, and the temple of Minerva in it. But the forum was only completed by his successor Nerva (in the year 98), also named from him the forum of Nerva. Of the eastern side of its enclosing wall there still stand two magnificent columns with rich relief frieze and cornice with modillions, only the upper portion rising above the ground.

135 An extraordinary architectural activity was developed by the highminded Trajan (98 - 117), not only in the care for his empire and people, for military roads, harbors, bridges, aqueducts, baths, but also for beautifying his palace. He caused a ridge of rock 98.4 ft. high between the Capitol and Quirinal hills to be removed and erected there the forum of Trajan with the five-aisled and bronze roofed basilica Ulpia and the very surprising column of Trajan (see page 123). By this forum Trajan threw all other imperial forums into the shade. His architect was the highly gifted Apollodoros of Damascus, in whom Grecian art in design was united most fortunately with oriental love of magnificence.

Under Hadrian (117 - 138) the best period of Roman architecture closed with an abundance of grand and splendid structures, both in the north and in the south, in the west as well as the east of the vast empire. He was himself a great art connoisseur, built in Rome from his own designs the colossal double temple of Venus and Roma with vaulted cell in two divisions, in which the two apses abut against each other, a pronaos at each end and an enclosing peristyle of 10 x 20 columns in colossal dimensions. In the rebuilding of the Pantheon on the site of that erected by Agrippa and destroyed by fire in the year 110 A. D., he brought the round temple to unsurpassed completion (Figs. 160, 161). The interior of this rotunda dedicated to the highest gods (according to the stamp on the bricks built between 110 and 125 A. D.) brings the wonderful harmony of the classical antiquity into evidence in an overpowering manner. The drum is subdivided by eight deep, alternately rectangular and semicircular niches, and it has a diameter of 142.7 ft. and a height equal to half as much. The total internal height from the floor to the crown of the dome equals its diameter. The richly coffered dome leaves open above a circular opening 29.5 ft. diameter in clear width, the so-called eye, by which an entirely ideal lighting is produced. "No temple interior on earth equals it". The portico is visibly added to the domed structure; therefore in spite of the inscription, it can no longer with certainty pass for the work of Agrippa.

In the vicinity of the capital, at the foot of the Sabine m

mountains, Hadrian caused to be erected his magnificent villa near Tivoli, the most famous in antique architecture (see page 127), and in Rome the Aelian bridge (pons Aelius) as a direct access to his **grand mausoleum**, already mentioned, the modern Castle of S. Angelo.

In the fourth period were completed striking innovations in architecture, which therefore appears interesting to us, since they present all the characteristics of an entirely **Barocco** conception of art, as we can follow them on the buildings of the transition from the late Renaissance to the Barocco style (at the end of the 16 th century). They clearly result from the endeavor to surpass even the previous great works by an increase of magnificence unknown before, in the use of variegated and costly kinds of stone and noble metals, and by the principally ornamental conception and treatment of the architectural members. The structural regularity of the columns lessens in respect to their placing and form treatment; they become an expressly ornamental motive, and as such are sometimes doubled as coupled columns. The capitals were animated by figure ornament. The friezes commonly receive a swelled and ogee section, or even what is to be particularly considered, a rich subdivision by vertical consoles. On the wall surfaces the semicircular niche finished with a shell at top plays a great part. The caps are broken, while the arch has horizontal returns at the ends (Fig. 162 a); in certain cases even the pediment is divided (rock-cut tomb facade at Petra). Likewise the surfaces of the facades and cornices occur in wavy forms, and even the "colossal order" of columns extending through two stories, so characteristic of the Barocco style, is found in some examples (Fig. 162 b). To this is added an extremely showy and extravagant richness in ornamental decoration, in which all the details exhibit Barocco tendencies. The first suggestions are already found in the buildings of Trajan and of Hadrian. If one wanders among the extensive ruins of the villa of Hadrian in Tivoli, then frequently occurs the sensation, that one might be in the ruins of a palace from the Barocco period of the 16 th and 17 th centuries A. D., in view of the marble slabs with curved borders of the panels, the rounded angles and the wide

and swelled profiles. Even the acanthus leaf assumes here and on the frieze of Trajan's forum (now in the Museum of the Baths) the Barocco alterations and the grooved surface.

The roots of this antique Barocco style are indeed to be sought in the oriental love of splendor in the East, from which they were transplanted to the West by the impulse of the gifted Apollodoros of Damascus and under the direct influence of Hadrian. Yet also here does it indicate an increase of decorative means, that must result as an necessary conclusion from enhanced show and the greatest possible development of pomp as the aim of an art tendency. It is to be regarded relatively as the stage of decay of Roman art, and so much the more, since at the same time occurs a very striking neglect of construction. But considered by itself, at least in the East, this represents the climax of its development.

During the fourth period relatively few artistically important architectural works originated in Rome. On the northern side of the Roman Forum Hadrian's successor, Antoninus Pius (138 - 161), in the year 141 erected for his wife Faustina the elder, also dedicated to himself after his death, the beautiful temple of Faustina and Antoninus, of which yet remain the portico with 10 elegant Corinthian columns of cippoline, a magnificent frieze in relief (Fig. 130) and a simple though nobly treated cornice. Marcus Aurelius (161 - 180) built in honor of his deeds in the war against the Marcomanni and the adjacent races a column of honor, similar to Trajan's column. In memory of the victory of Septimus Severus (193 - 211) over the Parthians and Arabs was erected the triumphal arch named after him on the northern angle of the main forum (Fig. 163), in a luxuriant richness of forms, but on which a decadence from classical art design is apparent. Grand indeed were however his palaces on the Palatine, from which broad passages, galleries and massive substructures remain, and the famous Septizonium of Severus, a three story facade nearly 328.1 ft. long as a monumental termination of the Via Appia. With the works of the first rank are reckoned the Baths of Caracalla begun in the year 212, the most important of the public baths of Rome, in plan and treatment a model design of the highest perfection.

(Fig. 145.). The baths of Diocletian dedicated in the year 305 even surpassed those of Caracalla in magnitude, but were inferior to them in the solution of the plan. (The majestic main hall, spanned by three cross vaults, was utilized by Michelangelo as the transept of the church of S. Maria degli Angeli). Likewise from this time dates the so-called temple of Minerva Medica (see page 103), indeed originally a nymphaeum connected with baths or an imperial villa. The arch of Constantine near the Colosseum erected in the year 316, for which architectural fragments and sculptures were taken from the arch of Trajan, removed at the same time, in order to save time, produces a splendid general effect in its excellent preservation, but is no longer satisfactory in the portions dating from the time of its erection. But late antiquity was yet to produce a work of bold grandeur, the basilica on the Roman Forum, commenced by Maxentius and completed by Constantine (about 315). (Fig. 164). It had as ground area a rectangle nearly extending from east to west and 328.1×249.4 ft., with an open portico of piers on the eastern side, from which three doorways opened into the interior. This consisted of a principal interior in three aisles and a semicircular apse lying opposite the main entrance and closing the middle aisle. The latter had the colossal width (clear span) of 82.0 ft. (For comparison it may be stated, that the middle aisle of the most spacious Gothic church, Milan cathedral, is 62.3 ft. wide, and that of Cologne is 49.2 ft.); it was spanned by three cross vaults 114.8 ft. high above the floor. The side aisles have a width of 57.4 ft. and were each covered by 3 tunnel vaults 80.4 ft. height of crown, whose axes were perpendicular to the main axis. In this last great work the antique architecture of Rome created the model of a three-aisled basilica and thus another type of building besides the Pantheon, and which became of wide-reaching importance for the Christian architecture commencing with Constantine the Great (305 to 324 or 337).

The love for building of the imperial monarchs and the example afforded by them exerted an influence far beyond the walls of Rome, even in the extreme provinces of the vast empire. Everywhere that the Romans had founded permanent settlements, a

are also found now the ruins of important architectural works. Thus for example from the imperial period still remain 125 triumphal arches, of which 30 are in Italy including Rome, 14 in France, 6 in Spain, 1 in Germany, 54 in north Africa and 20 in the eastern provinces. After Trajan the north African possessions, particularly ancient Numidia, had developed into prosperous civilized domains.

In Italy are still found well preserved temples at Assisi, Brescia and Pola; amphitheatres at Verona and Pola; triumphal arches at Aosta, Susa, Rimini, Pola, Ancona and Benevento.

Southern Gaul already in the 7th century had a Grecian colony, founded by the Phoceans (the bold seamen of the Lydian city of Phoea). Roman art found there a well prepared soil. However the Grecian tendency continued, even after the country was conquered by Caesar and entirely changed into the Roman spirit. The remains of Roman buildings standing in Nîmes (Fig. 166), Arles, Orange, Vienna, S. Remy and in other places afford to us now a very interesting representation of a noble Gaulish Roman art.*

** In middle and northern Gaul, the Celts had settled after the middle of the last thousand years B. C. These were found even in the La Terre period, when they were supplanted by the advancing Romans under Caesar.*

Likewise in Germany are still preserved numerous ruins of castles, baths etc., most complete in the great but tasteless gate at Treves, the Porta Nigra.

The eastern Roman provinces, chiefly Asia Minor and Syria, after the reign of Augustus enjoyed a long period of peace, in which occurred a wonderful revival of Roman art. Trajan had erected on the highest part of the Acropolis of Pergamon a magnificent Corinthian temple of white marble with enclosing porticos, the Trajaneum. Hadrian especially favored Athens, completed there the great temple of Olympian Zeus between the Acropolis and the Ilissos, and erected as the entrance to his new Athens (Hadrianopolis) the arch of Hadrian, 44.3 ft. wide and 59.1 ft. high. (Fig. 167).

In the 3rd century the centre of antique civilization was transferred farther eastward. The central power had declined

and the national character of the eastern races became stronger again. The love of magnificence in the Orient was purified by the Hellenistic-Roman spirit and enriched by the very important technical acquisitions of the West. Thus in the numerous cities of Asia Minor and Syria, in great part founded by the Romans and soon flourishing, works were produced, that even surpassed the contemporary buildings of the West. Columnar construction on the porticos along both sides of the main streets and the corresponding gateways came to a splendid development. The principal street of Palmyra in Syria was accompanied on both sides by a double colonnade to a length of 3723.8 ft., each row counting 375 columns. Similar streets with porticos were possessed by Ephesus, Antioch, Miletus, Sidon, Apamea and Gerasa. In the treatment of the columns was expressed a very free conception. At the great temple of the Sun of Palmyra, the columns of the portico have corbels projecting at one third their height for the reception of statues; on the ruins of the columns of Gerasa, a series of ascending acanthus leaves surrounds the shaft above the base. (Both motives are again found later in the architecture of the middle ages and of the Renaissance). The grandest ruins of eastern Roman architecture are those of the sanctuary of Heliopolis, the modern Baalbec, the once great and rich city of Syria between Lebanon and Antilebanon. The great temple of Jupiter Helioptinus (Fig. 168) had the plan with two courts, recalling the Semitic religious buildings, a smaller hexagonal forecourt, before which a columnar portico and a flight of steps 141.1 ft. wide as the termination of the great portico avenue, and a spacious inner court measuring 282.2×319.9 ft. with the great altar of burnt offerings and two basins for purifications. This altar court is enclosed at the entrance and both sides by alternating rectangular and semicircular exedras. At the fourth side and opposite the entrance stands the colossal temple, a peripteral structure with 10×19 corinthian columns with a double colonnade in the front portico. Of the adjacent smaller peripteral temple, which however has the considerable dimensions of about 124.0 ft., the extremely rich doorway and the cell 65.6 ft. wide remain, one of the most magnificent Ro-

Roman interiors with the Barocco motive of a "colossal" order " extending through two stories, the stories being indicated by window-like recesses, the lower ones spanned by round arches, the upper being crowned by angular caps. (Fig. 162 b). Both temples were founded at the middle of the 2 nd century. But the larger one never came to completion. A very free Barocco treatment is shown by the small round temple of Baalbec. Its cell wall has an animated treatment externally by round niches between pilasters; the projecting columns rest on a plinth curved inward between them, and are crowned by a similar cornice. 143 (Fig. 162 a). Yet farther in the Barocco spirit proceed the facades of the rock-cut tombs of the East from the 3 rd and 4 th centuries. Those of Petra (east of the Dead Sea) have great width and height (up to 98.4 ft.), break the entablatures by fanciful returns, and even interrupt the pediments for structures like tabernacles.

As already mentioned (page 24), Egypt maintained its national character, even under Roman rulers. But in the remaining north Africa the Barocco style matured very luxuriant products of magnificent effect, inspired by the freedom of oriental art design. Already in the triumphal arch of Trajan in Timgad (Algeria) the arcade with columns and richly returned entablature becomes a purely picturesque and finely membered decorative architecture. Just as beautiful is the arch of Tripolis, erected in the year 163 by Antoninus Pius to Marcus Aurelius and Lucius Verus.

In the palace of Diocletian (284 - 305) at Spalato on the eastern coast of the Adriatic Sea (see page 127), the entire cornice rises in a round arch over the middle wall colonnade, and this cuts into the tympanum above it. There are also found arcaded walls on columns, that are connected by continued round arches, as well as the purely ornamental subdivision of the wall by dwarf columns on consoles with a series of round arches above them as a direct prototype for the Romanesque round-arched frieze. (Fig. 169).

Toward the end of the 3 rd century the architectural activity of the eastern Roman empire was chiefly concentrated at Byzantium (Constantinople), the city that forms the natural gate-

gateway from the West to the Orient. Constantine desired to elevate it to a world city by employiing unusual magnificence, which in nothing was inferior to Rome, so rich in the splendid architectural works of the earlier ages. Numberless temples, basilicas, palaces, government buildings, libraries, baths, g gymnasia, honorary columns and the like were erected and equipped in truly oriental splendor with variegated marbles, bronze, silver, gold and precious stones. To a higher development passed the structural acquisitions in Vaulting, especially in dome construction. But the great mounmental course of Roman-Grecian art was never again reached; the members degenerated and the ornaments withered. The architecture passed into the Byzantine style.

In equal measure Rome and the entire West receded in importance. The last great work was previously mentioned on page 130, the city walls of Aurelian, finished in 276. At about the same time also expired the formerly luxuriant activity in building in the western Roman provinces.

With the division of the empire by Theodosius the Great in the year 395, Rome and the antique world came to an end. New and youthfully fresh races from the North then appeared on the stage of Roman history. While they perfected their governments, there also entered into art the inheritance of dying antiquity. Thereby this, even if in much changed form, was retained for the new civilization of the German peoples.

IX. Early Christian Architecture in the western and eastern Roman Empires.

1. General and historical basis.

In the same period in which the antique world under the rule of the Roman emperors rose to the climax of its power and its external magnificence, there came from its bosom a new spirit, entirely renouncing antique life and antique views of the world, that of Christianity. From the little nation of the Jews, to whom it was reserved from primitive ages to know the one God, came the formula of the Christian religion. Under him was formed in Palestine and the adjacent provinces of Syria the first communities of believers in Christ, and from these the teachings of the Saviour quite early were transferred to the Roman capitol, in which numerous Jews were settled in the first century of our era. With unusual rapidity Christianity won a place in the world city on the Tiber; already about 64 existed there a flourishing Christian community. After this during the first three centuries had victoriously passed through a hard period of suffering and unequalled persecution, indeed supported by the wonderful power of its faith, and the teachings of Christ had received recognition by the state (by Constantine the Great in the year 312), Christianity commenced from Rome outward its world historical and world convulsing course. Thereby also began a new period for western art.

But then quite imperceptibly and slowly was completed the transition from the antique to the new art, born from the Christian spirit. In the same manner, that Christianity found extension, it undermined in the East as in the West of the empire the deeply rooted tree of antique life, which thereby gradually came to die. In the year 394 by the emperor Theodosius the Olympic games were prohibited, and in 529 the last pagan school of philosophy at Athens was closed. But the faith in the ancient gods still remained active in the people, even after the pagan sacrifices had been strictly forbidden by Theodosius (in the year 392). Thus antique and Christian art long remained beside each other, and since special types can only be produced by slow growth, the latter must at first employ pagan forms, transformed in the Christian sense and filled with

its purpose; Christianity breathed a new soul into the antique form.

But the utilization of Greco-Roman architecture resulted quite externally in complete freedom and independence of spirit. The first Christians paid the less attention in this, when in regard to the inner meaning of their faith, they opposed the formal beauty of the antique with greater indifference. They did not fear to take columns and entablatures from temples devoted to destruction, and to build therewith their Christian Houses of God. (Fig. 170) In certain cases even the entire temple was directly transformed into a Christian church (for example the Pantheon in Rome and the church of S. Maria Egiziaca in the so-called temple of Fortuna Virilis). Where the provision of antique columns was exhausted or was entirely wanting, the architects, trained by the view of their native works, also executed the forms created by them with greater artistic freedom than those. Thereby appeared in Early Christian art, with the simplicity required by the religious demands and the isolation in the different parts of the empire, also local and provincial peculiarities, until they passed into new national and strongly expressed art styles.

Consequently the evolution of Early Christian art presents no uniform and harmonious picture. Its home and limitations are quite uncertain, both in time and place. In the West of the empire, particularly on the classic soil of Roman art, in Rome itself and the remainder of Italy, the antique form treatment still predominated for centuries. This characterized here the period of "Roman-Christian" or "Antique-Christian" art. This bears the Roman stamp until the time, in which the overrunning of the western Roman empire by the Germans could maintain itself, until the end of the 6th century. Its ground principles were retained until the days of the Carolingians (end of the 8th century), in which a new evolution was gradually prepared, the early German art. In the East, especially in the recently founded capital Byzantium, Grecian traditions more strongly appeared in the foreground, even if in combination with western and oriental elements. There was developed a peculiar transition style, the "Byzantine-Early-Christian"

style, which after the 5 th century was widely extended in the Italian provinces conquered by the barbarians and rose to high importance under Justinian (527 - 565). But since the Greek and oriental orthodox church began to separate from the Roman Catholic and went on its own way, its art passed into the Byzantine - Mediaeval style. For the East the appearance and advancement of Islam characterizes the close of the Early Christian period and the beginning of the middle ages.

The evolution of Early Christian art in the western Roman empire extended especially from Rome and Ravenna. The latter harbor city, well fortified and naturally protected by the surrounding marsh, had been made by the emperor Honorius at the invasion of the Visigoths (in the year 404) the "impregnable" imperial capital. There resided also the Ostrogothic king Theodoric (449 - 526). Since after a war of conquest by Justinian, with the fall of the Ostrogothic monarchy Italy became a province of the eastern empire (from 555 - 568), eastern Roman art penetrated into Ravenna. Thus intermingled in this city Roman-Early-Christian, early German and Byzantine influences in a rich series of well preserved monuments, which present great interest for the history of art.

In the eastern Roman empire Early Christian art was chiefly concentrated in Byzantium (Constantinople), the residence city of the eastern Roman emperor. Yet there occurred also a very important and perhaps fundamental portion of the earliest Christian art history in Asia Minor and particularly in Syria. There Christianity developed during the first centuries a flourishing life. The lack of wood, especially in the south and in the modern Hauran, led to exclusive construction in stone, whereby pier and arched construction rose to a high development with excellent stonecutting. There still lie numerous ruined cities with entire streets, churches, monasteries, cemeteries and the like, partly in the same condition, as when abandoned by the inhabitants at the advance of Islam (in the 7 th century). Among these are found nearly all structural types of the Christian church already in a very early period, so that we have to seek there for very important early stages of Christian art. Under Justinian they were transplanted to Byzantium.

Then probably as late offshoots of the stream of civilization introduced with the Hellenization of the West, they penetrated by the sea routes also into Ravenna, Milan and Marseilles, where they exerted a fructifying effect upon the Christian architecture of the West.

II. Evolution of Early Christian architecture and monuments

The most important architectural problem was seen by the first Christians, not in the establishment of sanctuaries for holding divine service, for which sufficient opportunity was afforded by the living rooms of well to do associates in the faith, but in the care for the burial of the dead in accordance with their views, separately from the cemeteries of the pagans. Since burial within the limits of the city was prohibited, the roads outside the walls for miles were bordered by tombs, the use of fertile land was regarded as sinful, and indeed also because the Christians desired to bury in rock-cut tombs after the prototype given by the Divine Saviour after the Jewish rite, were arranged common burial places or cemeteries in subterranean passages and halls, the catacombs, which likewise served for assemblies at the memorial services and as places of refuge in time of need during the persecutions of the Christians. First with the recognition of the Christian religion (in the year 312) commenced the evolution of Christian architecture, and indeed it at once proceeded with animated activity, that experienced strong assistance from Constantine the Great.

The most important architectural undertaking of the Early Christian period is the creation of the Christian church building. For this ground forms were developed, one of which, the basilica, is the chief structure of the Christian House of God in the West, while the other form, the central building, with a great dome characterized the churches in the eastern Roman empire and in the Orient. From the additions to the churches already in the Early Christian period were derived monastic architecture. In the architectural treatment and decoration of Early Christian churches and of contemporary secular buildings was completed the transition from the Roman and Grecian antique to the German and the Byzantine mediaeval styles.

The catacombs (Fig. 171) were arranged outside the city and

chiefly in soft tufa according to definite plans in uniform distribution, like a subterranean network of streets with many branches, extended for miles by the sextons (fossores). The passages had an average width of 3.28 ft. and a height of 9.6 to 13.1 ft., and they were lighted and ventilated by small light shafts (Luminaria). Several stories frequently lie above each other, being connected by stairways. Along both sides of this passage are cut rectangular recesses (loculi) to receive the bodies. After burial these were closed by marble slabs with the inscribed name or mystical symbols. For prominent tombs, for example for princes of the church and martyrs, the passages were widened or separate sepulchral chambers (cubicula) were arranged. Generally such graves are formed as recesses in the walls and are characterized by a round arch (arcosolium). In the paintings on the walls and ceilings of the catacombs very remarkable examples of the oldest Christian art have remained to us. But on the whole men scarcely went beyond the most extreme needs in the arrangement and treatment of the interiors. An architectural development resulted but seldom. The Crypt of the Popes in the catacomb of S. Calixtus near Rome was treated like a chapel with four columns attached to the side walls and an altar with marble balustrade; the square crypt of S. Januarius was lined with small marble plates. Since the tombs were under protection from the law, the downward stairways and entrances next the street could be correspondingly indicated. But later, when the persecution of the Christians also extended to the burial places, they were carefully concealed. At the end of the 4th century burials in the catacombs diminished, and they entirely ceased at about the middle of the 5th century. Thenceforth the cemeteries were arranged beneath the open sky. Among the numerous cemeteries in the vicinity of Rome the most important are those of Ss. Calixtus, Sebastian, Domitilla, Priscilla, Agnes, Januarius and Praetextus. Similar plans are found near Naples, Chiusi, Milan, in Sicily, Alexandria and other places.

Over the catacombs were erected the first Christian houses of prayer, of which some already existed at the beginning of the 3rd century. Later and about the end of that century,

they had become numerous. Concluding from the few remains, these cemetery basilicas (*basilica cimiterialis*) or triapsal cell (*cella trichora*) rose from a square ground plan, extended on three sides in semicircular apses, the fourth being open at first, but later receiving a small addition (Fig. 172). Ruins of such structures have remained in Rome over the catacomb of S. Calixtus (*basilica* of S. Calixtus, of S. Cecilia and Soteris), and on Via Tiburtina (*basilica* of S. Symphorosa). With the very modest dimensions the cell could only be intended for divine service, while the believers occupied the open space before it. As prototypes of Christian church buildings, these little tomb chapels are only to be considered under limitations.

In the 4th century was developed the ground type for the principal structures of Christendom, the basilica.

Its form of ground plan was derived from both the Roman for-
 ensic (see page 117) as well as from the palace basilica, and also frequently from the Roman private house, whose atrium, *alae* and *tablinum* exhibit a striking similarity in the arrangement of the interior. Even coincidences with the Egyptian temple are indicated. But we can rightfully regard the Christian basilica as a peculiar and independent creation of Christianity, that directly originated from the problem set before the architects, of creating covered interiors, that might receive the community gathering to the common celebration of the love feast, and whith men might everywhere follow the divine service and understand the spoken words. For the crypts (*subterranean churches*) arranged in the catacombs, whose ground plans were indeed exclusively devoted to the requirements of Christian worship, have entirely the same subdivision of the interior, as later became the rule in the basilicas; the main room for the community, the presbytery and the apse for the clergy. (The name of "*basilica*" for the Christian house of prayer first occurs in the time of Pope Julius I, at the beginning of the 4th century. The Latins had the names of "*ecclesia*, *conventiculum* and *dominicum*".).

The Christian House of God thus had from the first a purpose entirely different from the religious buildings of antiquity. Those were exclusively dwellings for the deities worshiped in

representations, into which the priests alone were permitted to enter; to the people they chiefly appeared by their external architecture as consecrated gifts to the gods. But the Christian church formed the place of assembly for the devout community. The centre of artistic development thus lies in the internal architecture.

In the ground plan of the Early Christian basilica (Fig. 173) is apparent the endeavor by the arrangement of the rooms behind each other to afford opportunity to the believers to gather together and to propose accordingly to participate in the sacred ritual. In the complete plan, one enters from the street through a small portico into the atrium, a large rectangular court surrounded by porticos on all four sides and containing a fountain (cantharus) at the middle for ablutions. The free space was laid out as a garden, from which the court also received the name of "paradise". In the court remained the penitents, until after sufficient internal purification they were permitted to enter the House of God; here was also baptism received. From the portico lying opposite the entrance (outer portico) three or five doorways, placed at the centres of the different aisles, led into the church proper. (The name comes from the Greek kyriakon, House of the Lord, stoa kyriaka, i.e., Hall of the Lord). One first passed into the nave, a rectangular and elongated structure, subdivided into three, or in unusually large basilicas into five, aisles by two or four rows of columns, (Fig. 184), in which the middle aisle occupied the chief space and was much higher. Unconsciously are the eyes of those entering directed by the rows of columns and the entire treatment of the interior to the foreground, in which they look through the triumphal arch, resting on massive piers of columns, and fall upon the most important part of the interior, the choir (sanctuary, presbytery or priests' house; see Figs. 174, 175). The choir was originally formed as a great semicircular niche, the apse (tribuna concha, exedra, bema), but soon by a transverse aisle (transept or cross aisle) inserted between the apse and triumphal arch, was enlarged to the height and also generally to the width of the middle aisle. At the centre of the apse, the perspective sight point of the entire plan,

stood the altar, a stone table (mensa) erected on several steps, with a canopy likewise of stone and resting on 4 columns, the tabernacle or ciborium. The priests had their places on the chairs placed around against the wall within the apse. On the axis and behind the altar stood the elevated seat of the bishop, the cathedra. The choir was always raised by several steps, and also frequently the transepts. The need of space usually led to an extension of the choir, so that a portion of the floor of the nave lying before the altar was included in the choir, being raised higher and enclosed by a balustrade.

157 (Fig. 174). The lower clergy and the choir of singers took their positions there. Erected at the sides of this front choir were pulpits, the ambos, for the reading of the epistles and the gospels. The places on both sides of the altar and outside the choir enclosure were reserved for the favored classes, on the left being the matroneum for distinguished women and nuns, on the right the senatorium for prominent men and monks. The side aisles lying next these remained open to other women and men. Many basilicas had further in the interior near the entrance a narrow transverse vestibule, the narthex, separated by a low parapet wall for the catechumens, the pupils already advanced in the Christian faith. Towers were not yet added in the construction of the Early Christian basilicas. Only after the 3rd century was a bell tower (campanile), in Rome with square ground plan and in Ravenna mostly with a circular one, was erected beside the basilica but without connection with it. For the arrangement of the basilica on the site, orientation soon became the rule, i.e., the extending of the longitudinal axis from west to east, so that the apse was turned toward the rising sun. Whenever possible, men took care, that the altar stood over the tomb of a martyr (confessio, later crypt; see page 149); at least relics of saints were placed within the altar stone.

This normal ground plan of the western basilica is not invariably retained. The atrium frequently was omitted and replaced by a simple portico. The eastern basilicas almost always have a vestibule (narthex); on the other hand the transepts are omitted; above the arcades of the middle aisle are general-

generally erected galleries for the women. Likewise in some earlier basilicas of Rome (S. Agnes) are found such two story side aisles. The north African buildings commonly have instead of an apse a rectangular ending of the choir. In Ravenna the transepts are lacking; on the other hand the side aisles in part end in apses. The portico becomes a vaulted vestibule, called *ardica*. Here in plan and treatment the Roman influences intermingle with the Byzantine.

In the superstructure may be seen very plainly, that the entire attention of the architect was devoted to the treatment of the interior. The architectural details were regarded throughout as unimportant. The walls were constructed of bricks, tufa or ashlar without particular care. The columns were taken from antique buildings; there were considered merely as supports and were set in rows without much reference to their forms, whereby long shafts were reduced, short ones lengthened, and to equalize them were employed bases and capitals of different heights. Over the columns were placed antique entablature blocks directly beside each other, just as they could be obtained (S. Lorenzo near Rome, Fig. 170), or (regularly after the 5th century) the round arches were set directly on the columns (Fig. 175), originally chiefly without mouldings. The high walls of the middle aisle (clearstory) received no architectural treatment of any kind, aside from a flat band extending above the archivolts. In the uppermost part, the "clearstory", they were ~~opened by~~ round arched windows, that were closed by curtains and transennae, i.e., thin transparent plates of marble with small circular or netted cut openings. By these the interior received the desired magical lighting.

The covering followed in the apse by a choir vault in the form of a spherical half dome, in the other interiors by horizontal wooden ceilings divided into coffers and richly decorated by colors and gilding. But most commonly the beams and rafters remained entirely free and visible, with a corresponding treatment in color. (Fig. 175).

The exterior of the basilica is characterized by the raised middle aisle with gable roof, the low side aisles and the front portico with shed roof sloping against the middle aisle, the

round or polygonal apse with conical or pyramidal roof, and the detached bell tower. (Figs. 176, 186). All is extremely simple and without ornament, excepting the mosaics on the facade. The entire value is in the interior. In regard to the latter, the basilica counts among the most prominent internal creations, that architecture in general has to show.

The central building represents the second chief form of the Early Christian House of God. This architectural type is already complete in itself, for which the antique gave distinguished models (Pantheon), presents a form very suitable for baptisteries (baptismal churches) and mausoleums (tomb churches); it also usually came into use for these in the West. But for the community churches its choice produced the great difficulty of organically adding the choir with the altar to the building. The altar should naturally occupy the most prominent place in the domed interior, thus be at its centre. But men could not so decide and therefore extended the domed interior by an added choir, usually built in the form of a great niche.

153 Thereby was expressed again the desired longitudinal direction, but also the ground idea of the central structure, the relation of the whole to the centre disappeared. Yet indeed the central building ensured a high monumental effect by the esthetically important and just perfect solution of the form of the ceiling.

The ground plan exhibits in the usual form in baptisteries and tomb churches a unified interior over a regular octagon or a circular area with four niches arranged at right angles, that frequently project externally like apses (baptistery of S. Giovanni in Fonte near the cathedral at Ravenna). In a more developed plan the clearstory wall of the domed interior rests on columns, that are connected by round arches. The interior is extended below by a low and likewise vaulted aisle, so that also here is obtained a certain arrangement in three aisles. (Tomb church of S. Costanza near Rome). On the community churches constructed at a considerably greater scale, the symmetry so strongly accented by the central plan indicated an entrance recess of equal width opposite the choir, as well as two side niches, whose axes intersect the longitudinal axis at the cen-

centre.(Fig. 177 a). In this manner was obtained a certain agreement with the plan of the basilica with transepts. In the ground area of the interior was then expressed the form of the Greek cross, important in Christian symbolism, that finally became the scheme for the Christian churches of the East. In the most primitive undivided plan, the two arms of the cross intersected, so that a square was formed at their crossing, which was spanned by a dome (over the inscribed circle), while the arms of the cross received tunnel vaults (a well preserved example of this ground form is afforded by the tomb church of Galla Placidia in Ravenna). With the great capacity for variation and addition in central buildings, the full completion was contemporary with a great number of manifold solutions for the plan. Until in the first half of the 6th century (i.e. until the erection of the church of S. Sophia in Constantinople), the polygonal form of the middle space was preferred. This was formed by a system of piers set at the angles and connected by round arches, on which rested the clearstory and the dome. Around the main interior extended a usually two story aisle within a likewise polygonal (concentric) but also later square external structure with niches in the angles.(Fig. 177 a). The niche motive found extensive employment everywhere, in a particularly effective way also with the columns set in a semicircle extending outward with arcades between the inner piers. The most mature solution of the plan for Early Christian central architecture was attained in the church of S. Sophia at Constantinople, built by Justinian and dedicated in 537, in which the domed structure enters into close combination with the system of the basilica.(Fig. 177 b). In order to obtain there a kind of middle aisle, the domed square main interior was extended by two great semicircular niches of equal width, on whose longitudinal axis adjoins at one side the entrance exedra toward the west, and at the other the choir apse at the east. Right and left of the middle domed interior on the axis of the cross aisle lie side divisions, separated from the main aisle by two rows of columns, and extended in front and rear, so that they form side aisles in a manner. Thus the interiors of S. Sophia make a basilican impression, even with

the strong accenting of the central ground idea. (Also see Fig. 182).

The ground plans of the later Roman churches of the Early Christian period retain the division into three aisles with the choir apse on the main axis, and mostly with apsidal side rooms (pastophoriums). But they group the interiors in the form of a Greek cross about a central square, whose vaulting by a dome on pendentives with the basal circle inscribed in the square (Fig. 178) now met with no difficulties. The arms of the cross were covered by tunnel vaults. The vestibule was made especially prominent by doubling, or even a three aisled plan of the narthex. (See Fig. 192).

With the execution of the buildings of Syria constructed of cut stone, the erection followed with the almost exclusive use of bricks for the walls and brick ribs with concrete filling in the mode already practised for vaulting. Thereby were made secure such parts of the structure, that were particularly affected by tension and compression by corresponding strengthening and by buttresses. In certain cases (tomb church of Galla Placidia, baptistery of S. Giovanni in Fonte and S. Vitale in Ravenna) the vaults were built much lighter by clay vases inserted in each other and grouted. In the construction of the ceilings as vaults, so that they stood in corresponding alternations with the interiors and the frequently massive piers, lay the chief problem of the architects; this was solved by them in great part in a magnificent manner. In forms of vaults are found the tunnel, cross, choir or niche vaults and the dome, the latter but rarely in polygonal form as a cloister vault. Nearly always was the hemispherical dome chosen, indeed in the first period as a somewhat depressed and elliptical section line, but later in the full rounding of the hemisphere, and indeed both over square as well as polygonal areas, that were changed into the circular form by corbellings or spherical spandrels. (Pendentives). (also see page 106 and Fig. 178). The domical vaults were frequently intersected by window openings in a series extending around them.

On the exterior the dome remained partly uncovered, and it was also partly covered by tiles or a lead covering. By the

massive dome vault, that like a colossal helmet spanned the nucleus of the centrally arranged masses of the walls, was substantially determined the entire external appearance of the central structures. Otherwise (with the exception of the churches in Syria) the exterior remained without any architectural and artistic decoration. The high monumental effect is indeed based on the organic subdivision of the structural masses and on the harmony of proportions.

The architectural treatment omits in the Early Christian church buildings the refined feeling for perfected handling of forms. The rules employed through so many centuries for the proportions of columns and entablatures, intercolumniations and the like are no longer in force. The entire centre of gravity of artistic magnificence no longer lies in the architecture, but in the color effect of formative symbolical representations, well harmonized to the interior. In comparison with this the architectural details must entirely recede. Thus in Early Christian art the classical details echo but slowly. Their forms were at first neglected, then weakened and replaced by new forms, in which may finally be recognized an entirely free treatment.

The changes in style may best be followed in the capitals. In the western Roman empire those of Ravenna are especially important. Antique sculptured pieces were hard to obtain there; they were in part brought from oriental workshops. Thereby the Byzantine influence made itself felt quite early. Among the new capitals there are found those, that are derived from the bell shape of the Corinthian capital, but instead of the Grecian acanthus is a tasteless, ornamentally ribbed and notched foliage (Fig. 179). Besides these also already occur (after 528) the entirely simple Byzantine type of capital with impost block, in which appears the form of a cube diminished downward or folded and rounded, so that the circular section of the column directly passes into the square upper area. The ancient organic relief treatment is thereby dropped. The basal form is only covered by shallow cut foliage and network or basket-work with the insertion of Christian emblems (Fig. 180). This die impost capital was developed on central buildings in

the East and is chiefly employed in them, but also gradually appeared in basilican designs.

From the capitals directly rise the arches in the Roman monuments. But in Ravenna is inserted a trapezoidal intermediate block, enlarged upward, the impost block. This was typified in Byzantine art, perhaps as a reminiscence of the broken entablature block of Roman architecture in projecting columns, but also perhaps from purely structural reasons, since the form of the column was originally intended for the reception of a horizontal entablature and appeared to require such an addition, when used for another purpose. The round arches thereby seem stilted; they rest lightly and elegantly. (First proved is this impost block in the subterranean water reservoir near Eschrefije Sokaghy in Constantinople, dating from about 421). Among other architectural innovations are further the first noteworthy beginnings of an external subdivision of the wall, composed of narrow vertical projections (lisenés), that are connected by arches beneath the edge of the roof (arched frieze). They are found on the basilica of S. Apollinare in Classe near Ravenna, (Fig. 186), and repeat on the exterior the rhythmic movement of the columnar arcades, the chief motive of Early Christian architecture.

The ornamentation develops in the interiors a religious magnificence corresponding to its purpose. If the means allowed it in any way, the floors were laid with variegated mosaic patterns of marble tiles, and the plinths of the wall surfaces in the apses and also wherever possible in the transepts were faced with brightly colored marble slabs. But the chief ornamentation constantly lies in the mosaics, with which were finished the choir vaults, the triumphal arch and the upper surfaces of the apse, the transepts and even the nave. The Romans had scarcely employed this art except for floors. But the Early Christian architects composed with the colored and gilded glass enamels, that were pressed into the lime coating of the masonry, representations of the Saviour, the apostles, the saints etc., and thus they created an unusually permanent wall ornamentation, harmonized excellently with the architecture and the dignity of the House of God, and which produced a solemnly ear-

earnest and often thrilling effect by the simplicity of the forms and the strong connection of the forms rising from the transparent blue or gold grounds. (Fig. 181). The greatest richness of the art of Early Christian interiors is found in the Byzantine central buildings, and among those S. Sophia in Constantinople presents the most splendid example. (Fig. 182). For the columns were employed the most select and finest blocks from the temples of Asia Minor. The piers and wall surfaces ¹⁵⁸are faced with costly slabs of the finest stone up to the cornices below the vaults. But the vaults themselves gleam in gold mosaics with Biblical representations and ornamental borders in the character of fabrics wrought with gold and of unequalled magnificence.

The Early Christian ornament (Fig. 183) verifies the influences of the antique, both in the feeling expressed for harmony as well as in many details. The ground form of the acanthus leaf and particularly its scroll work are retained; to these are added new motives, chiefly the symbolical meaning; the vine and vine branches, the palm of victory and the victor's wreath, olive branches, the lamb, stag, dove, cock, peacock, ship, fish ~~and~~ the like (recalling Biblical occurrences and comparisons or the name of Christ). Very common are cross forms of all kinds and the monogram of Christ, composed of I and XP, the two initials of the Greek designation of Christ, mostly in connection with an A (alpha) and O (omega); "in Christ is the beginning and the end"; compare the monograms in Fig. 183. During the rule of the Lombards in upper Italy (568 - 774) the ¹⁵⁹German elements to be mentioned later entered into Roman-Christian ornamentation.

Byzantine-Early-Christian art adhered closely to Grecian and oriental prototypes. But the acanthus leaf evermore became flatter and received a sharp edged and spiny treatment. The chief motive was formed by a Hellenistic scroll frieze, interwoven in oriental linear forms, with ever more stiff and pattern-like treatment, until it finally entirely was intertwined in a geometrical network.

The most important monuments. -- Of the basilicas are but few remains preserved in the western Roman empire, that allow the original impression to be recognized with certainty, since

the high walls of the middle aisle resting on isolated colonnades did not resist well the severe earthquakes and the conflagrations, to which they were much exposed by the wooden roofs, and the entire design made very easy the construction of restorations and additions.

In Rome the most important of the five aisled designs are :-- S. Paolo-f-l-M (Fig. 184), the most spacious of all basilicas, grand in design and equipment, portico, nave with 80 granite columns, transverse aisle and apse, begun in 386, destroyed by fire in 1823 as far as the choir, then rebuilt from 1828 according to the same plan and in the same forms. The ancient basilica of S. Peter from the 4 th century, arranged according to a similar ground plan and of approximately equal size as the church of S. Paolo, replaced during the Renaissance by the new church of S. Peter.

To the three aisled basilicas belong (. Pudenziana, apparently constructed about 145 (?) by Pope Pius I in a hall of the baths, but already with archivolts over the columns; S. Maria Maggiore, a spacious three aisled structure with architrave connections above the columns and from the second half of the 4 th century; S. Sabina on the Aventine, placed in the year 425 on the foundations of the temple of Juno, with 24 antique columns, and aside from the mostly walled up windows of the middle aisle remaining in its original condition (Fig. 175); S. Lorenzo-f-l-M (Figs. 170, 160, 185) from the end of the 5 th century, and S. Agnes before Porta Pia (7th century), both with two story side aisles (galleries); S. Maria in Cosmedin, built in the 6 th century, transformed in the 8 th century into a three aisled plan with a beautiful square campanile of 8 stories erected later (end of 11 th century); here occurs the first example of the alternation of columns and piers in the arcades and the design of a crypt (sepulchral chamber) under the choir; S. Maria Antiqua on the Roman Forum, built in the 7 th century 165 in the atrium of a library formerly connected with the temple of Augustus, with segmental apse, flanked by two chapels; S. Pietro in Vincoli, first plan from the year 442, giving a representation of the complete three aisled basilica with transverse aisle and three apses. From the later time (9 th centu-

century) also date S. Clemente (Fig. 174), built on a three aisled earlier church with completely preserved choir design (choir, ambos, altar etc.), and S. Prassede with horizontal entablature above the columns and with three massive brick arches spanning the entire middle aisle for supporting the ceiling and roof and resting on piers extending higher.

Plans for a single aisle without columns are rare in Rome. To these belongs Ss. Cosma e Damiano, built 326 - 330 with the utilization of the temple of Romulus on the Roman Forum, and S. Balbina near the baths of Caracalla and from the 6th century, both with a semicircular apse.

In Ravenna:-- S. Apollinare in Classe, the former port of Ravenna, built 534 - 541 (Fig. 186), with enclosed vestibule, three aisled nave with wide middle aisle and a great apse, internally semicircular and externally a half decagon, and a detached tower, the classical example of the Early Christian basilica. The columns were made on the spot and already lack the entasis; S. Apollinare Nuovo, the most important basilica erected in the city by Theodoric the Great, dedicated in 504 (see page 169 below and Fig. 181), on a similar plan with two side apses, now walled up; the 24 columns came from Constantinople. S. Agatha (417) with a tribune, inner portico, external vestibule and round tower. S. Giovanni Evangelista (425) and S. Francesco (about 450), both with square towers. S. Spirito from the time of Theodoric the Great.

In the remainder of Italy are also still found important basilicas in Milan (S. Ambrogio, built in 382), in Albano, Brescia, Fiesole, Spoleto, and in Torcello near Venice. (See pages 195, 196).

In the eastern Roman empire until the end of the 5th century, the basilica was the principal type of the Christian House of God. Of the buildings in Constantinople, the church of S. John was erected in 463 and represents a normal basilica with narthex, three aisled nave, galleries over the side aisles, and an apse internally circular but externally polygonal, without a transverse aisle. On the lower columns rests a straight and continuous entablature, that like the capitals adheres closely in its forms to the Roman Composite order, but with Byz-

Byzantine carving of the foliage. The galleries open toward the middle aisle with round arches. In Thessalonica is arranged similarly the church of S. Demetrios from the middle of the 5 th century, but with round arches above the columns, already with impost blocks over their capitals.

Particularly noteworthy are the buildings in inner Syria. In the southern part of this province (in the Hauran) the exclusive use of stone early led to the introduction of piers with connecting round ~~transverse~~ arches, on which rest the ceilings of great granite slabs. (Basilicas at Tafka and Schakka, both three aisled, the latter without apse). In northern Syria stone construction early combined with the wooden beam ceiling. By the transfer of Grecian-Roman forms to the stone, hard to cut (chiefly granite), from their simplification and change gradually originated a peculiar internal and external architecture, that exhibits many similarities to the form character of the Romanesque period. The churches are constantly three aisled. The apse frequently lies within the rectangular enclosing structure, so that rooms like chapels occur at both sides. This plan is shown by the basilica at Rouiheha, in the midst of an enclosed court, arranged like the Grecian temple precinct, and at Tourmanin, whose richly treated facade with a great round-arched portal and a loggia of columns above it, which is flanked by two tower-like structures, produces an earnest and monumental effect. At the pier basilica at Kalb Luseh, the treatment of the external apse exhibits an architectural style, that may be regarded as the direct prototype for the early Romanesque form treatment in the West. This development is found in the form of a Greek cross with four arms, each three aisled and with three apses arranged on the longitudinal axis of the great church at Kalat Sim'an (Figs. 187, 188 a, 188 b, in which the internal system as characteristic of the Early Christian churches of central Syria presents especial interest, as well as prototypes of the early mediaeval architecture of the West.

In Palestine are also found certain five aisled basilicas, whose founding is still referred to the period of Constantine (4 th century), like that of the five aisled basilicas at Rome.

To these belongs the still well preserved church of the Nativity or of S. Maria at Bethlehem, arranged in cross form, the arms being rounded by apses.

163 The numerous buildings in northern Africa frequently vary from the ground scheme. They are of smaller dimensions, but are frequently five aisled with rows of columns or piers. The apse is frequently rectangular, included, and is sometimes repeated at the western facade. The free treatment leads to many important novel forms. On the Coptil (Early Christian in Egypt) churches occur instead of the round arch, stilted and broken, even the pointed arch. In the basilicas of Theveste and of Tipasa are arranged piers directly beside the columns supporting the arcade walls of the middle aisle, and in the basilica of El Hayz in the Libyan desert, the columns appear in intimate connection with the piers, projecting from them as half columns. Here is also found a very early example of the compound pier, later carried to a high development in the middle ages.

Monuments of Central Architecture. -- In Rome:-- the previously mentioned tomb church of S. Costanza and the baptistery of the Lateran, both from the 4th century; S. Stefano Rotondo with a peculiar ground plan (perhaps derived from an ancient market hall), a circular central room being surrounded by 22
164 Ionic columns, that on a horizontal architrave support the upper wall. Around it extend two concentric aisles. The axes are emphasized by spacious exedras between the outer row of columns and the enclosing wall. (Fig. 189).

In Nocera in Southern Italy:-- S. Maria Maggiore, built of antique dressed blocks, a circular domed structure with doubled columns set radially with outer aisle and added small tribune. In Perugia:-- S. Angelo, similarly arranged as the church just mentioned, with an accenting of the principal axes by widening the arches above them.

In Ravenna:-- the already mentioned baptistery of the Orthodox or S. Giovanni in Fonte (5th century), and that of the Arians or S. Maria in Cosmedin (6th century), both on the same ground plan; further the likewise previously mentioned tomb church of Galla Placidia (built 440). The chief work is S. Vitale, erected 540 - 547, one of the most important monuments

of Christian architecture. The main interior has a regular octagon of 49.2 ft. clear width as its ground area, at whose angles rise massive and lofty piers, on which rests the hemispherical dome. At seven sides of the octagon intermediate spaces extend in semicircular niches, each interrupted by two columns, connected by round arches and indeed in two stories. (Figs. 190. 191). The niches terminate above in choir vaults. Radially around the central space is a two story enclosed aisle, externally octagonal and of about 114.8 ft. diameter. This is interrupted at the eastern side of the octagon by the plan of the choir with the semicircular apse projecting beyond the enclosing wall. Opposite the choir lies the vestibule. (Now walled up and set diagonally). The interior is splendidly treated. The shafts of the columns lack entasis. The capitals have the specific Byzantine form with impost block. (Fig. 191). The walls are faced below with variegated marble and in the choir are adorned by very valuable mosaics.

In Milan:-- the famous church of S. Lorenzo, in the basal plan dating from the period of 559 - 563 (in which Milan was under Byzantine rule), but now existing only in an incomplete restoration from the 18th century. The ground plan was indeed influenced by eastern Roman models. It substantially consists of a square middle room, extended on all four sides by niches interrupted by rows of columns and surrounded by a parallel two story corridor. The crown is formed by an octagonal polygonal dome, that rests on concentric and corbelled arches in the cut off corners of the square. The entire structure is a grand creation, that served the masters of the Renaissance as a model.

In the East the previously described church of S. Sophia (church of the Divine Wisdom; Figs. 177 b and 182), built (532-537) by Anthemios of Tralles and Isidoros of Miletus, denotes the climax of Byzantine architecture. It belongs to the greatest works of genius in architecture of all times. The plan is in the form of a Greek cross and is already found in the church of the Apostles at Constantinople, designed as the burial place of Constantine the Great, restored by Justinian and imitated in the church of S. John at Ephesus. (The church of the Apostl-

Apostles was a model for S. Ambrogio in Milan, and this again in its turn indeed influenced the tomb of Galla Placidia in Ravenna). In the church of S. Irene in Constantinople, likewise erected by Justinian, the middle aisle was covered by two domes lying beside each other. At the church of S. Sophia in Thessalonica in the ground form of the main interior, the Greek cross is more strongly emphasized, and the narthex is also extended along the two sides. The Church of Ss. Sergius and Bacchus in Constantinople, begun in 528 (Fig. 177 a), has a ground plan similar to that of S. Vitale in Ravenna, but is enclosed by a rectangular external structure with projecting apse. In the interior niches are arranged on the diagonals. For the plan of S. Sergius are found prototypes in the Early Christian churches at Bozra and Ezra in Syria, the former completed in 512 and the latter in 515. The later types of Eastern-Roman=Early-Christian churches (see page 154) with low domes and the arrangement of side domes over the angles of the Greek cross and sometimes also at both sides of the vestibule are represented by the church of S. Nicolaus in Myra (Fig. 19a), the church of S. Clement at Ancyra, and the church at Cassaba in Lycia. These already indicate the stage of transition to Byzantine-Medieval art.

The first monastic plans (monasteria) * were derived from the dwellings of the clergy, the necessary houses for pilgrims, shelters for watchmen etc., built in the immediate vicinity or added to the churches. The strict isolation of the life and the similarity of the requirements gradually led to architecturally completed plans. In these a court occupied the centre, placed at one longer side of the church for reasons of suitability, around it being grouped the cells as separate dwellings, as well as the larger community rooms, the chapter hall for assemblies, the refectory (dining hall), the library for the preservation of the sacred books etc. For the enclosure of the cloister court by porticos, particularly valuable beneath the southern sky, excellent prototypes were presented in antique columnar courts. From these originated the cloisters, latter peculiar to all monasteries. Among the numerous Early Christian monasteries, the most important are those at Theveste (Egypt) and Schakk in Syria.

* *Cloister* from Latin *claustrum*, "an enclosed place". Greek *monasterion*, originally "a separate structure", later synonymous with "cloister".

Early Christian secular architecture employed forms developed in the churches; in the ornamentation is even found the monogram of Christ. Yet besides the ruins of cities and of dwellings of Syria, partly extending back into the pagan period, and the great subterranean water reservoirs of Constantinople, built with hundreds of columns, only unimportant remains have come down to our time. The columns of the so-called basilica of Hercules and the palace of Theodoric in Ravenna are already to be counted with the monuments of the early German period. (See page 170).

Early Christian art is the fruit of an extremely impulsive period filled with mighty changes in all domains of intellectual life. Their importance and magnitude do not appear in their form, but in their meaning. Architecture was no longer the proper object for the representation of the beautiful, as once in the classical times of Grecian and Roman antiquity, but only a means for the expression of the higher spiritual idea of Christianity. A vast material domain was closed to an art. But it was not permitted to win its own circle of forms. What it brought to light in new ideas was only to come to full maturity in later centuries.

X. The early historical and Early Christian Architecture of the Germanic Peoples.

About the year 100 A. D. the Roman historian Tacitus wrote down in his "Germania" all his knowledge relating to the Germanic peoples. These then occupied central Europe between the Danube and the Ocean, between the Rhine and the Weichsel, and far beyond the frontier, that now separates modern Germany from the Russian empire. They were divided into a great number of races, each of which formed a separate state by itself. Their religion was polytheistic, like that of the Greeks and Romans. Their prayers and offerings were originally brought to the gods in sacred precincts, on mountains, at springs and rivers, only later in temples also. The chief gifts of mind and soul, which appeared in the religious representations, the expressed family tendency of the common life toward democratic and social life together, the manifestation of racial peculiarities, and in the first political arrangements, rendered this people in a high degree capable to enter on the remains of the dying antique, and to become the bearers of a new and elevated civilization.

When shortly before the end of the 2nd century B. C., the Germans for the first time came into contact with the Romans, they found themselves still in the condition of the later iron period. Tacitus says of their dwellings, that they were rectangular and rude wooden structures with steep roofs and a single room, constructed of unhewn trunks connected together by similar girts, and which were sunk into the earth or supported by stones. At the centre stood the hearth. With the different races of people occurred numerous diversities. The Celts (page 168) dwelt in slight round houses, whose framework consisted of piles connected together by interwoven work. The West Goths (Visigoths) in the lower Danubian provinces allowed (in the 4th century) the gable roof to project beyond the outer walls and to terminate in a shed roof supported by columns and forming a passage. In the far North among the Scandinavians, where the primitive German element remained present, to the great room with the hearth was attached an anteroom. The building constructed entirely of wood as a blockhouse had no

windows, with a single opening in the roof for the admission of light and escape of smoke. This arrangement was transferred to the northern temple, whose principal room became the cell of the gods with the altar of burnt offering at the centre and the images of the gods at the rear wall; the anteroom was enlarged to a nave, in which occurred the sacrificial feast.

It appears certain, that also to these primitive buildings were quite early transferred the mode of ornamentation shown on the utensils and ornaments of the bronze and iron periods. But the architecture of the Germans only passed to a higher development at that time, when they permanently came into contact with the civilization of the antique peoples. This epoch began with the migration of nations, a very important occurrence for the history of the world in the West, that great movement of the German races to the West and South, and which was the result of the need of land for the increasing agriculture in the wooded regions, and directly to the invasions of the Huns from the East. In its course (375 - 573) the different peoples took possession of the provinces of the collapsing Roman empire after severe battles with the hereditary occupants.* The Visigoths settled in Spain, the Ostrogoths and after them the Lombards in upper and middle Italy, the Vandals in northern Africa, the Franks, Burgundians, Allemans, Thuringians etc. in northern Gaul and in Germany, and the Anglo-Saxons in Britain.

** In Italy with the Italians (Umbrians, Orcans, Latins), in Spain and southern Gaul with the Iberians, whose primitive home was indeed Asia Minor, in middle and western Europe with the Celts, who probably before the first thousand years came from the East and settled in the region of the upper Danube and of the Rhine to the Weser, then pressed forward to the West into northern Gaul to the Ocean and the British islands, from these abodes terrorizing the entire civilized ancient world by their plundering forays.*

All these races already before or during the migration of nations were converted to Christianity, which then developed in them its strong moral power. But the realms founded by them on foreign soil were mostly of brief duration. The farther

they were removed from their native regions, the more rapidly was completed their decay under the unfavorable climate and the entirely changed conditions of civilization. Only the Franks, who kept themselves isolated longest, came out of the migration of nations without being weakened; they formed the only state erected by the Germans on the mainland, in which the individuality of their nature was retained. To them likewise fell in consequence the part of leaders among the Christian peoples of the West.

The Germans indeed became masters of the former Roman possessions. But in a similar sense, as that in their time the Greeks won the intellectual victory over the Romans, the high civilization of the subjugated likewise conquered the barbarians. Most clearly expressed this appears in the Italian provinces, to which was assigned the most varied fates from the 5th to the 8th century under the overflow of the German armies. There the architects of the new masters commenced with a direct imitation of antique works. Also the Visigoths in southern Gaul and in Spain, the Vandals in Africa, the Burgundians in the Rhone country depended on Roman architecture. Yet men manifested in even the earliest works, even if still in uncertain touches and attempts, the first steps to a new principle of treatment dictated by the art invention of the Germans.

These had brought from their northern home a certain mystic tendency, an animated feeling for nature, enjoyment of strong effects, preference for construction in wood and the working of wood, and a peculiar ornamentation developed on utensils and ornamental articles, particularly by the Celts, and consisting of linear bands and interlacings, interwoven scrolls with animal and plant forms, which they also soon transferred to the stone construction taken from the antique. Thereby from the first this received under their hands a German-Celtic flavor.

Roman technics were comparatively soon made their own by the northern architects. But the architectural subdivision they approved without understanding. Their later works bore the same relation to the white marble palaces of the South, just as the brightly colored showy garments of the Germans, gleaming

with rubies, garnets and gold, did to the white and majestically floating toga of the Romans. In the gradual permeation of the ancient civilization by the new, this evermore won the supremacy under the leading art spirit of their rulers, until finally entirely individual art forms of specific northern stamp appeared. Thus the early German art became a bridge between the antique and the mediaeval world.

But the transition was but very unequally completed, since the appearance of the different races in the history of art and the course of their art practice did not occur with equality. Therefore it is not possible to draw sharp limits in time and to consider early German art in a unified representation; we must pursue it on the monuments of the different peoples.

The first works of a monumental architecture produced by a German race, we meet with in the buildings of the Ostrogoths in Italy. After the overthrow of Odovaker, a German military leader, who enthroned the last western Roman emperor Romulus in the year 476 and made himself master of Italy, they founded in the year 493 a great kingdom extending far beyond the frontiers of Italy, with Ravenna as the capital. Their king Theoderic the Great conceived the idea of imparting to his fellow countrymen the benefits of the ancient civilization, and of producing a union of the foreign elements. He devoted the most lively interest to architecture. His court church of S. Apollinare Nuovo has already been mentioned among the Early Christian buildings of Ravenna (Page 160). It still differs in no wise from the Roman or Byzantine works of that time. But a creation of a particular kind is the tomb of Theoderic near Ravenna, erected about 525 (Fig. 193), a massive two story central structure. The decagonal lower story comprises a Greek cross plan covered by tunnel vaults. The upper story is decagonal below and circular above, and is reduced to leave a passage 3.94 ft. wide. It contains a circular interior and is covered by a colossal block of Istrian limestone, cut as a low dome with 10 eaves, 38.0 ft. in diameter, 8.2 ft. high and weighing about 400 tons, whose elevation alone represents a splendid achievement in technics. Around the upper story formerly extended a low arched portico resting on consoles with dwarf

columns. (The projecting stairs are additions of a later time). The ornament extending around on the heavy cornice (Fig. 194) already occurs in the Northern-German style of decoration, while the lower round arched niches with impost moulding, the arcade gallery and the bold profiles exhibit a manner of treatment, such as reappears in the Romanesque period. Thus this building, whose covering stone recalls the dolmens of the prehistoric period, then appears like a monumental Hun's tomb derived from the antique and northern elements. In the broad and quiet landscape around Ravenna it is striking as a peculiar monument of earnest power and height. From the rich activity of Theoderic in private architecture are still derived the eight granite columns of the so-called basilica of Hercules on Piazza Vittorio Emanuele in Ravenna with very freely transformed composite capitals, two of which bear the monogram of Theoderic. On the contrary the so-called palace of Theoderic standing near the basilica of S. Apollinare Nuovo, a two story brick structure with round arched portal and blind arcades (Fig. 195), according to more recent investigations, is no longer with certainty of the time of Theoderic, but is probably to be referred to the beginning of the 8th century.

After the decay and fall of the Ostrogothic kingdom, the Lombards invaded Italy and established their rule there, which they maintained for more than 200 years (568 - 774). But they developed a lively architectural activity, particularly in the later time. They took into their service the Italian mechanics and stonemasons settled in the region about Lake Como, the Gomacine masters, and even gave an orderly regulation to the style of architecture usual there. Yet the architectural designs produced experienced no substantial enrichment; the antique ashlar construction notably deteriorated under them. They showed themselves more fertile in architectural decoration, when from the combination of Early Christian symbols with Byzantine motives and Northern-German elements, they created an entirely individual relief ornamentation, which toward the end of their sway developed into an independent style, but only attained full maturity later at the end of the 8th century. This is chiefly of three strands of interlaced bands of a frequ-

frequently irregular interweaving in connection with plant and animal forms, more rarely with human figures, the latter then being in a very primitive and formless treatment, the whole executed in low relief, so that the drawing remains and the ground is merely incised. A characteristic example of this style is presented by the ciborium of the altar of S. Placidius in the left side aisle of the basilica of S. Apollinare in Classe from the beginning of the 9th century. (Fig. 196). This Lombard decorative art spread from Italy into southern Gaul and far into central Italy, where occur numerous remains of ciboria, altar facings, choir enclosures and the like. As a chief work is to be mentioned the baptismal fountain of the church of S. John at Gividale, constructed in the year 737. (Fig. 197).

In the buildings of the Visigoths in Spain, where the Iberian primitive inhabitants, the Vasconians (Basques) had early mixed with the invading Phoenicians, Carthaginians, and later with the Romans, and where under the rule of the latter, particularly under Trajan (who was himself a Spaniard), Hadrian and Marcus Aurelius, the first rich and splendid architectural activity of Spain had commenced, very different art tendencies crossed, so far as may be known from the few still existing monuments of the postroman time. The small three aisled basilica of S. John Baptist at Banos de Terrato near Valladolid (Fig. 198), from the year 661 according to an inscription, exhibits dryly imitated Roman Composite capitals, at the altar niche being a slightly horseshoe arch, with incised ornaments in the frieze in the style of Lombard art. After the invasion of the Moors (in the year 711, see page 218), Christian art maintained a footing only in the extreme North. The Early Christian basilicas constructed there mostly have arcade porticos along the longer sides as a Spanish peculiarity, in which echo Moorish motives, but in the interior have the plain archaic German incised ornamentation. As the most important monuments are to be named:- S. Salvador at Oviedo, built in 802 by the Visigothic master Tioda, and the somewhat later church of S. Maria de Naranco there; the three aisled Benedictine church of S. Salvador de Valdedios near Villaviciosa, dedicated in 893,

without transverse aisle, the choir separated from the nave by columns and arches, and the three aisled church of S. Miguel de Escalada near Leon with transverse aisle and from the 10 th century.(Fig. 199).

At the conquest of the British isles, the Anglo-Saxons entered a country, in which Christianity had already struck firm root after the beginning of the 5 th century. But this was driven by them from the south of England into Ireland, where it found a very fertile soil, on which a rich ecclesiastical life developed, which soon powerfully reacted, at first against Anglo-Saxon England and Scotland, but then also against the continent. (The Christian faith was brought by Irish monks of the 6 th and 7 th centuries, Ss. Columbanus and Gallus, the founder of the monastery of S. Gall, to the Alemans by S. Kilian of the Franks and S. Rupert to the Bavarians. Willibrod and Boniface were Anglo-Saxons).

/// Stone construction was already practised in the British isles at a very early time, indeed in direct connection with the megalithic monuments, (See Stonehenge, page 8), originally with uncut stones and later (after about the 6 th century) with cut stones and the use of mortar. The oldest dwellings of this kind were round structures with the form of beehives or rectangular plans in the shape of inverted boats. Enclosing walls of Cyclopean masonry and frequently of unusual beauty surrounded the inhabited area.

The designs of dwellings were models for the first Christian religious buildings, the oratories. These are relatively small structures, mostly consisting of but a single cell, among which that of S. Gallerus in the county of Kerry in southwest Ireland (Fig. 200) has been remarkably well preserved. On it as well as on the primitive doorway at Maghera (Fig. 201) appears the same construction, that we have already learned to know in the earliest stone architecture of the civilized nations of antiquity. On the oldest Christian churches of Ireland and Scotland, mostly containing but a single room (for example S. Carinin in Ireland), certain rude window forms of rough vertical, or stone slabs set inclined toward each other, there recall the stone masonry of the archaic period. Beside and in

the Irish-Celtic stone architecture, soon after the invasion of the Saxons from the continent, this peculiar mode of construction, characterized by the use of wood, makes itself apparent; the log construction composed of wooden trunks and beams laid on each other, and of half timber work with walls of sills, posts, girts, purlins and stone panels in the openings thus formed. Thereby early British art secured a proper structural basis. The stone supports employed to bear the covering slabs or round arches over the openings in walls permit the influence of an older structural method to be clearly recognized in their early round forms like balusters.

Further intermingling impulses come from Roman-Early-Christian art by means of the Christian faith. Already at a very early time the Roman basilica found entrance. For the church of S. Martin at Canterbury and the monastery church at Wearmouth (from the year 670) workmen were brought from Gaul and Italy, who carried out the execution in ashlar construction, the so-called "opus Romanum". The alternation of piers and columns in the walls of the middle aisle, the galleries and a tower over the crossing of the middle aisle, and the transverse aisle becomes the rule. Central buildings are only rarely found (for example in Hexham).

At the Irish and Scotch churches, as in Ravenna, stands a round slender tower, diminishing upward and terminating with a conical roof, at a distance from the church.* The decoration betrays a mixture of the native Celtic-Irish ornamentation with antique or Byzantine-Early-Christian and Merovingian-Frankish elements.

** Such towers were carefully constructed with ashlar set in mortar, and in the early period of Irish architecture were built in considerable numbers, evidently as places of refuge during the forays of the northern pirates (Vikings). At the beginning of the 19th century, 118 of these towers could still be proved by their remains.*

The great development of the early German art, like that of political and ecclesiastical history, was completed in the kingdom of the Franks. As such is designated at about the middle of the 3rd century A. D. the entirety of the peoples on t

middle and lower Rhine. They divided later into several races, of which the Salians dwelling on the lower Rhine, pressed onward toward the southwest in the course of the 5th century, and founded a powerful state under the Merovingians (481 - 751). In the year 486 this put an end to the last remnant of Roman rule in Gaul, subjugated the Romanized Celts settled there and the Romans, and then without regard to the frontiers of the races, extended farther toward the southwest and east, over the Visigoths dwelling on this side of the Pyrenees, over the northern portion of the domain of the Alemans, over the Thuringians, Burgundians and Bavarians. An unusual upward course was taken by France under the Carolingians (751-843), especially in the splendid time of Charlemagne (768-814). This powerful monarch saw his most important problem on the one hand in the thorough internal organization of his kingdom and its extension to its natural frontiers, on the other hand in the fulfilment according to his conception of the duties falling to him as the protector of the Christian church and in the extension of Christianity.

He subjugated (774) the Lombards threatening the Pope, then he received in the year 800 the Roman imperial dignity, converted the opposing Saxons, and reduced them under his sceptre; finally he gathered the entire western West into a world empire, that stretched from Garigliano in southern Italy and Ebro in Spain to the North Sea and the Elbe, from the Atlantic Ocean to the Elbe, the Bohemian forest and the Raab in Hungary. In this condition the Frankish empire was likewise of brief duration. Its history ends with the division carried out in the year 843 under the grandson of Charlemagne; then began the history of the eastern Franks (Germany) and of the western Franks (France).

With the Christian faith Christian architecture also found entrance and zealous care in the Frankish lands. Already the Merovingians carried on building actively. Yet even of this very slight remains are now proved. The cathedral at Treves (Fig. 202), a square with sides about 131.2 ft. long, divided by 4 massive columns with cross arches into a middle and two side aisles, covered by a horizontal wooden ceiling and furn-

furnished with an apse added later, originated from a pagan judgment hall. At the ancient church of S. Martin, completed in 470 but now destroyed to the foundation walls, the apse was apparently surrounded by an arched portico supported by columns, and which was transformed in an imposing way in the 9th century (page 181). The quite irregularly shaped baptistery and the ruins of S. Genereux at Poitiers still permit the recognition of the picturesque treatment of external wall surfaces by forms in stones of different colors. (Fig. 203). For the remaining masonry the use of small rubble (3.94 - 6.30 ins), the "opus gallicanum" was the rule.

The evolution of Merovingian church buildings was indeed influenced in a determinative way by Milan and in a more distant way by the forms of the Hellenistic-Christian architecture of the Orient transmitted by the sea route through Ravenna. (See page 146). The entire plan follows entirely the basilican scheme. On certain churches was already completed the transition, very important to the history of architecture, from the former T-shape (crux commissa) of the Roman basilica to that of the Latin cross (crux immissa or capitata) of the mediaeval basilica. This innovation was caused by the insertion of a square bay between the transverse aisle and the apse. (Compare Figs. 173 and 208). For the first time it appears on the church of S. Germain des Pres at Paris, dedicated in 558, which the Frankish king Childebert I had caused to be planned in cross form "in accordance with the life-giving cross". The abbey church of S. Denis near Paris built by Dagobert in the year 629 still had the T-form. The ancient church of S. Peter in the citadel at Metz, erected at the beginning of the 7th century and notable for the ornamental fragments found there, consisted merely of a three aisled nave with choir. On the contrary as proved by documents for the monastery church in Rebas, founded in 634, the abbey church at Fontanella, founded in the year 648, and the church of the monastery of Gemeticum near Rouen, built in 655. It appears as an innovation produced by the Benedictine order, by which the House of God in its ground form was already impressed with the image of Christ's church. Doubtless purely practical reasons also determined this, the

expressed need for an enlarged choir space with regard for the ever increasing clergy and the extending development of ecclesiastical magnificence.

The architectural forms in general exhibit a dry imitation of the antique columns and entablatures without substantially changed treatment. In the ornament is combined Roman-Early-Christian symbolism with northern and Lombard motives in the well known incised low reliefs, which is indeed likewise characteristic for the contemporary art of the East.

An animated upward course was taken by the Frankish activity in architecture under the Carolingians. The powerful impression, that Charlemagne received from the imposing architectural works of Italy, aroused in him the desire, with his endeavor to restore a west Roman empire in the sense of the antique idea of the state, to likewise bring about in architecture a renewal of the Roman power. He wished to educate his Franks to a higher civilized life, and he surrounded himself at his court with a staff of learned men and artists, by whom classical culture was fostered and cherished. Among them the art-loving Einhard took the most important place. He zealously studied the law books of the Roman architect Vitruvius Pollio. (See page 134). What great interest the mighty emperor devoted to the question of church architecture is shown, in that he established thorough regulations for the founding and erection of churches and instituted careful collections for their maintenance. Models and plans were prepared and the conduct of the erection was entrusted to practically qualified officials. From the capital at Aix-la-Chapelle must arise an imperial residence city equalling Rome; it was adorned by very magnificent buildings, whose splendor was mentioned with amazement by the Italian poet Petrarch during his journey through Germany in the 14th century.

By favor of circumstances the principal work of Carolingian architecture has been preserved to us, the imperial chapel of Charlemagne in the central building of the cathedral of Aix-la-Chapelle. (Fig. 204). The plan shows numerous similarities to S. Vitale in Ravenna (see page 164); the dimensions on the ground are also approximately the same. Yet one must not consi-

consider the imperial chapel as an imitation of S. Vitale, as generally occurs; at least the structural and architectural details exhibit no accordance whatever. The basal design indeed came from the intellect of ~~Einhard~~; as architect is mentioned Otto of Metz, and the erection occurred between 796 and 804. Around a regular octagonal central building of about 49.2 ft. clear width and 82.0 ft. high (to the imposts of the vaults) is placed an aisle carried in two stories and enclosed within a regular polygon with sixteen sides. Since each side of the inner polygon had one of the external polygon parallel to it and of equal length, the ceiling was subdivided into 8 squares and 8 triangles, which received in the lower story cross or triangular compartment vaults. The high upper story above this is covered by steep tunnel vaults rising toward the central structure; these effect a transfer of the side thrust of the dome to the outer walls. The dome does not follow the Byzantine scheme like S. Vitale, but the Roman polygonal dome (cloister vault, see page 106), while the side surfaces are rounded inward in a circular arc and close at the vertex. The small and likewise two story altar recess projecting beyond the sixteen sided polygon with the dimensions of its side had to give place to a spacious choir in the 14 th century. The opposite and somewhat larger vestibule is flanked by two round stairway towers, organically added to the body of the structure. For the internal construction the imperial master had columns and costly materials brought from Italy, particularly from Ravenna over the Alps. The columns were set in two tiers above each other in the high arcades of the upper story. The cornices and mouldings remain very simple and poor. So much the more richly is the internal mural decoration treated with marble facings and mosaics. Of the entire costly equipment, only the splendid bronze grilles of the gallery balustrades have escaped destruction. Like the Early Christian churches, the exterior received no particular architectural development. The construction is excellent, the substructure and the angles of the polygon in ashlar, the remaining masonry in quarried stone. It proves that men had then mastered the antique technics with great certainty.

The imperial chapel at Aix-la-Chapelle on its part was regarded as a wonderful building and therefore was frequently imitated. Of the churches that arose under its influence are to be named as important and yet remaining to our times; the church at Ottmarsheim in upper Alsace, erected between 1000 and 1050, externally octagonal, but in the interior (aside from the already cushion shaped capitals) with surprising fidelity imitated from the chapel at Aix-la-Chapelle at a smaller scale; the western choir of the minster at Essen (between 947 and 1000), of which three sides completely agree with those of the central structure at Aix-la-Chapelle in the form of the gallery, the arrangement of the columns and forms of capitals.

The ancient and venerable church of S. Michael at Fulda (820-179 822) is a central building, that in the ground plan of the superstructure and of the crypt follows the prototypes afforded by the Roman tomb churches of S. costanza and S. Stefano Rotundo at Rome (page 163; Fig. 205). The circular middle area of the superstructure is surrounded by 8 columns, that are connected by round arches and support the clearstory wall and dome. Around it extends a low aisle terminating in the circle. The crypt is arranged in two concentric rings, the outer one being subdivided transversely into rooms, around a stumpy middle column supporting the inner annular vault. Bases and capitals, the latter with heavy impost slabs, exhibit dry imitations of antique forms. *

** Independently of these central structures have been developed in the far North peculiar types of their system; the round churches still standing on Bornholm in southern Sweden and Jütland from the early German period. These buildings are to be regarded as independent northern creations. (See Volume II).*

Beyond the time in which these three monuments originated, the idea of the central building embodied in the imperial chapel at Aix-la-Chapelle has fertilized but very little the later German-Mediaeval architecture. The western men could not be satisfied with the central plan, where the altar, to which naturally was assigned the centre as the most prominent place, must be moved back into an added choir with regard to the divine service. The basilica corresponded to it infinitely better, and therefore they constructed with it the further evolution

of Christian church architecture. In this now appeared very important innovations, that chiefly concerned the form of the ground plan.

The plan already shown by certain Merovingian buildings as the Latin cross or cross shaped basilica, gradually became the rule. In order to prepare for the body of the saint a worthy place suited for veneration, there was given to his tomb an imposing form. In some Early Christian churches of Italy (for example S- Apollinare in Classe and the cathedral of Torcello), the tomb of the saint of the church (see page 151) forms a small vaulted cell beneath the altar with a passage in annular form extending along the wall of the apse, which in Merovingian buildings have cells like catacombs, connected by passages. In the Carolingian period the tomb became a spacious hall divided by detached supports, the crypt. It frequently had a cross form and a three aisled shape with apse, like the upper church. The choir lying over it consequently was generally raised by several steps, whereby it was made the more effective.

If the church were dedicated to two saints, as frequently occurred, then since the eastern end could no longer be extended, men decided to enlarge the plan at the western end by erecting there a second choir with crypt opposite the principal choir. In this basilica with double choirs, the portico and western facade of the Early Christian period were omitted. The main entrance was then transferred from the middle to the front end or even the side of the side aisles. Finally the western portion was further enlarged by a second transverse aisle inserted between the nave and the western choir.

The construction likewise passed into noteworthy innovations. Instead of the columns previously employed, if the structural material did not prove to be sufficiently resistant, or the technical training of the workmen did not offer sufficient security, the strong square piers appeared as supports of the clearstory walls, either in continuous arrangement or in rhythmic alternation with columns.

Of particular importance was the inclusion of the towers in the structure. The Early Christian churches indeed had bell towers in their immediate vicinity. Hence the assumption appears justified, that the Germans did not create the tower mot-

motive for themselves, but transferred it from Italy and merely employed it in a different way. Still in northern churches the evolution of the western towers from a defensible round tower placed before the nave with several stories of rooms for using weapons, into a broad rectangular tower covering the entire facade, and finally to double towers with portico and gallery between them, may be followed by steps from the round castles and earliest church buildings until in the 10th century. Therefore we should regard the towers as a primitive German motive, that also in the middle ages attained its highest development on German soil. In the Frankish kingdom the bell tower was frequently placed above the crossing square of the nave and transverse aisle, and it was also soon flanked by two side towers.

Of the numerous buildings erected under Charlemagne's animated care of Christian church architecture or soon after him, but few are intimately known to us, and then are mostly so by written mentions. Among the latter we possess a document of high value in the history of architecture; the plan of the monastery of S. Gall. It originated in the year 820 or shortly before, is executed on parchment in red lines, explained by written notes, and comprises the entirety, of which it certainly represents an ideal scheme (see page 183). The ground plan of the church (Fig. 208), a three aisled basilica with a transverse aisle, choir square, eastern and western choir apses (this for Peter's and that for Paul's altar), takes thorough care of the needs of the monastery by the indication of numerous altars. In opposition to the loose proportions of the dimensions of the Early Christian basilica, it already has that fixed normal plan, which was always retained later, by which the crossing, i.e., the square crossing of the middle and transverse aisles was repeated once on each side as a transept and four times in the principal direction as a middle aisle, the side aisles each having a half square in width. Two round towers (R) stand in symmetrical arrangement at the sides of the main entrance on the western facade, without being directly connected with the church. Behind them lies an annular open portico with a garden. Besides this plan nothing further now remains of the building.

Among the western Frankish churches, the cross form with doubled choir and doubled transverse aisle is established at the abbey church of the monastery of Centula (S. Riquier), built 793-798. At the ancient and venerable basilica of S. Martin at Tours (page 176), the most famous church of the ancient land of the Franks, the arched portico around the apse was transformed into a choir aisle with radially arranged chapels, in order to make possible a very near view of the veneration of the corpse of the saint to the masses of the crowds of believers, and that rested in a sarcophagus placed in the choir. Caused by purely reasons of appropriateness, we thus meet here with the first example of the enlargement of the choir with a series of chapels, so important in the middle ages.

Of the Carolingian basilicas on German soil, the monastery church at Fulda, dedicated in 819, had a doubled choir and transverse aisle. At the old cathedral of Cologne (begun 814) and at S. Emmeran in Regensburg, doubled choirs are proved to have existed. But on smaller parish churches was also retained the T-shaped ground plan, thus on the two basilicas built by Einhard in 827 and 828 at Steinbach and Michelstadt, and at Seligenstadt in the Odenwald. Considerable remains of the former are yet preserved (Fig. 206). It was a three aisled pier basilica after the Early Christian scheme with open portico, transverse aisle, apse and a spacious crypt, which exhibits the *chux capitata*, differing from the T-shape of the upper church. To the columnar basilicas belongs still the church of S. Justinus at Höchst near Frankfurt-a-M., completed in 840, a above its Corinthian capitals being set a trapezoidal Byzantine impost block, and further the foundation church at Corvey on the Weser, erected in 844, on which the west facade is already developed with a gallery between two facade towers.

On account of the extremely rare condition of monuments from the Carolingian period, a building remaining to us in its former condition is particularly important, the gateway portico at Lorsch on the Bergstrasse (mountain road). (Fig. 207). It once formed the passage to the forecourt of the church completed in the year 774, at the dedication of which were present Charlemagne and his wife Hildegarde. The direct imitation of

the Roman architectural system is not to be denied here. Before the piers of the gateways covered by depressed round arches are set half columns with Composite capitals after Roman models, that bear a but slightly projecting belt course. The low upper story is subdivided by small Ionic pilasters with angular gables extending in a zigzag line. A simple modillion cornice crowns the whole. The tapestry-like facing of the facade with white and red slabs is especially noteworthy; it evidences the love of the Germans for picturesque effect, that is expressed in the same manner in the Merovingian buildings.(Fig-203).

Besides the church buildings, the monastery buildings stand in the foreground of artistic activity. With determining influence upon the evolution of western monastic existence were the rules established by S. Benedict, by which was prescribed the community life of the monks. But the problems of the monastery were not alone limited to enhance the cure of the soul; the monasteries should rather become central seats of endeavors to elevate civilization. On the happily located Monte Cassino (southern Italy) had Benedict founded in the year 529 the first western monastery, which became a highly esteemed place of culture, from which the richest artistic impulses were borne beyond the Alps. Likewise the Benedictine monasteries erected on Frankish soil, among which those at Centula in Normandy, Fontanella near Rouen, Tours, Fulda, S. Gall and on the Reichenaue stand in the first line, showing themselves as very important starting points for all western evolution of civilization and of art.

The already mentioned plan of the monastery of S. Gall presents us with full conclusions (Fig. 208). The middle of the whole is occupied by the cloister court (h), surrounded by the vaulted open porticos, the cloister aisles (c), that on the north side being closed by the nave of the church (A, see page 180), and on the other three sides by the inner buildings of the monastery (the inner clausure). Among them the eastern contains the dwelling of the monks on the structure (B), lying in the exterior of the transverse aisle of the church, below indeed being the chapter (assembly, convent) hall with the warmed living room of the community (calefactorium), over it being

the dormitory (sleeping hall). On the northern cloister aisle lies the refectory (dining hall D), beside it (in the angle toward the West) the kitchen (F), and on the western cloister wing the cellar (E). This arrangement was retained during the entire middle ages as a fixed standard, whereby indeed according to the conditions of the ground, the cloister court sometimes came to be on the northern side of the church (Fontanel-la). At the eastern choir were found at one side the sacristy with parament chamber (K), on the other side being the library and the writing room (L). Around this nucleus plan-were grouped in the outer court, which was enclosed by a fortified continuous wall ("outer clausure") often defended by towers, the remaining structures for living, educational and assistance purposes, as well as for the household requirements of the monastery. For as far as possible, these were to be fulfilled by the labor of the members of the monastery. On the north side of the church and beside the transverse aisle and the choir lay the abbot's dwelling (S), before it being the school house (T), then the guest house (U) with its dependance (V), opposite on the south side of the entrance to the church being the pilgrims' house (1) with kitchen (2). Eastward and opposite the dwelling of the abbot was that of the physician (Z), opposite the choir being the great hospital (W), then (Y) the school of the novices (for the education of the pupils received) and beside it the cemetery (16). The entire southern side of the outer court received the buildings for housekeeping, the bakery and brewery (6) next the monastery kitchen, the mill (8 and 9), the cooper's and tinner's shop (3) beside the cellar, behind the refectory being the mechanics' shop (10). The eastern side was utilized for the agricultural structures, the stables (4, 5, 18), barns, sheds (17) and the servants' house (19). In exact accordance with this plan the monastery design could not be erected, since the conditions of the site were not considered in it. But it affords a very instructive example of the great architectural ideas, that the first period of western monastic architecture established in the days of Charlemagne. Nothing more remains of the buildings themselves, as well as of most other monasteries of this time.

167 Charlemagne also displayed an animated zeal in the erection of palaces, of which the most important were those at Aix-la-Chapelle, Ingelheim, Nymwegen, Frankfort and Worms. Likewise of these but very few remains may be proved, from which it is generally deduced, that the chapel and a large hall structure with a series of buildings enclosing some courts formed the most important parts of the imperial palaces. Into the city hall at Aix-la-Chapelle are built certain parts of the Carolingian hall, an elongated rectangular room with an apse at the western end and a horizontal wooden ceiling. With greater certainty may be restored the hall building at Ingelheim (erected between 807 and 817). The plan forms an elongated rectangle subdivided by two cross walls into a large hall and two smaller rooms. The former has the shape of a Roman basilica, whose relative dimensions are accurately preserved (95.6×47.8 ft.), thus the internal length being twice the width, as prescribed by Vitruvius), with a projecting semicircular niche having the width of the middle aisle, that occupies $\frac{3}{5}$ the width of the hall. On two rows of stone columns in each, connected by round arches, rests the horizontal wooden ceiling. The two smaller rooms before this hall, indeed intended as entrance hall and vestibule, were divided by internal free supports parallel to the side walls, into three aisles of equal width. We have no further data relating to the architecture, aside from the Corinthian capitals with impost blocks, that were indeed introduced from Ravenna,-- they are the same capitals as those of the church of S. Justinus at Höchst-a-M. The animated statements of contemporary writers concerning the magnificence of the imperial palaces with long rows of antique columns and the splendor of marble and of noble metals, in combination with the art forms of other architectural fragments and monuments of the Carolingian period, awake in us the conception, that this substantially means a reanimation, a renaissance of the antique, entirely produced by the personal will of the monarch, but which, even if unconsciously, was gradually permeated by the national German individual life.

Charlemagne's court art fostering stone construction, looking backward and preserving antique traditions, penetrated into t

the people but slightly. They firmly adhered to their native wooden construction, which already in the time of the Merovingians had attained to a certain technical maturity. We have indeed, on account of the perishable material, no remains thereof, but important written evidence. Venantius Fortunatus was bishop of Poitiers about 560, gave high praise in his poems to the flourishing cities on the Rhine, whose "masterly framed buildings" with the rooms paneled to protect from wind and weather, and the airy galleries surrounding the building on all sides, "richly appearing from the master's hand and artistically carved" **, which deserves more regard, since he was a widely traveled Italian, well acquainted with the splendid structures of his native land. We must likewise assume, that in the days of Charlemagne wooden architecture found itself on a high plane; it is also known, that he himself sent skilled workmen in wood to the South, while he called (Wälsche) masons and stonecutters from thence for his northern stone buildings. Thus the traditional German ornamentation, based on contact with the Roman antique, received from the Early Christian series of forms of Italy, permeated by eastern and especially by Byzantine elements; (Fig. 209), obtaining that training and enrichment, by which it became the basis for the decorative art of the early Romanesque period.

** Away with you, with the walls of ashlar stones, much higher appears to me a masterly work, here the wooden architecture. A paneled room, protecting us from wind and weather, the carpenter permitting nowhere a gaping crevice. Otherwise only stone and mortar together protect us; here the friendly forest affords it to us. Airily surround the exterior of the building the stately galleries, richly appearing from the master's hand and artistically carved". Venantius Fortunatus.*

In the southern provinces of the Frankish empire, in Italy was expressed under the Carolingians in ever increasing measure the penetration of the German art spirit. Indeed it showed itself there less in the plan of the buildings, than in the adoption of that style of decoration, which was developed by the Lombards in upper Italy, but first after their rule reached full maturity, and then also extended widely in middle Ita-

Italy. At least the Roman and also in part the Byzantine elements of Italian ornamental art of this time are richly permeated by northern motives, just as also the contemporary sculpture is entirely penetrated by the German spirit.

Still the basilican type on Italian soil in the 8th and 9th centuries come to no further development. But one peculiarity, borrowed from the Byzantine churches, makes itself apparent, the termination of each of the three aisles at the east by a separate apse. Among the monuments a rebuilding of the famous Milanese church of S. Ambrogio stands in the first place; from it remain only the three apses (completed 855), retained in the later and still existing structure. In the 10th century appeared almost a stop in the previously strikingly decadent art works of middle and upper Italy, and when these awoke to new life about the middle of the 11th century, they soon assumed that mighty upward flight, with which enters the period of the style of the Romanesque middle ages.

186a. XI. BYZANTINE ARCHITECTURE.

1. General and hisorical basis.

longer than to all other provinces of the former Roman world empire, there remained to the eastern Roman kingdom its possessions in the Balkan peninsula, protected against invasion by the Germanic peoples and the shock of Islam pressing forward from the Orient. The ancient high civilization of the Greeks and Romans maintained itself longest there. But its conclusion in the Byzantine empire shows in a striking degree the thorough transformations experienced by an isolated art tendency, if it be transferred to a different site of civilization. The new empire comprised the frontier provinces of the ancient Roman empire, which lay in part in the East, partly in the West. On the border line between the East and the West was founded Byzantium as the capital, in which was subsequently perfected the civilized life of the new empire. This was from the first equally accessible to influences from the East and the West. But the political centre of gravity of eastern Rome lay in the Asian provinces. Therefore Asian influences showed themselves stronger than European. Hence it came, that all political bases, still the same in both halves of the empire, the same form of government, the same laws and the same religion, were very soon filled with a different spirit in the eastern Roman empire, from that in the western. In it the new monarchs eagerly grasped the classical civilization as the inheritance of the decaying empire, and sought to make Christianity useful, giving to it a new and developing life. But in eastern Rome the government assumed an Asian-despotic character, that was but slightly softened by Christian customs. Puerile courtly and servile ceremonial dominated all forms of life and the entire nature of the state, by whose bureaucratic restraint the free development of powers was very much restrained. The contrast between the East and the West, already based on the thoroughly different conceptions of life, became even more acute and gradually led to a deep separation of the two developments of civilization, that also finally (in the year 1054) was expressed in a complete separation of the Greek church from the Roman.

The general picture presented by Byzantine architecture th-

therefore lacks that mighty, flourishing and progressive course of development, that one might expect in an empire with an existence of a thousand years. The actual highest period lay in the days of Justinian, with whose grand architectural creations, yet falling in the Early Christian period, a very promising basis was created for Byzantine art. But the later period never advanced beyond this, even in its best works. . . .

The image quarrel (726-842) caused by puerile religious disputes about the statement of Christian dogmas and by dynastic causes between the iconoclasts (image breakers) and the iconodules (image worshipers), wherein the latter remained victors, weakened the empire for more than a century and paralyzed all advances in artistic activity. Only after its termination and under the Macedonian emperors (867-2056) did this take a new upward course, when the oriental influences were checked and the classical, Greco-Roman tendencies came into the foreground.

The splendor of the empire diminished in the succeeding four centuries. In the year 1204 the crusaders conquered Constantinople and founded the "Latin empire" (1204-1261). This was indeed reconquered by the founder of the last Byzantine dynasty, Palaeologues (1261-1453). But under them the Byzantine empire sank ever lower, until at last entirely paralyzed, it fell in the contest with the Turks penetrating beyond the Bosphorus. -- But in contrast with the distracted condition of the West, the Byzantine empire, until late in the second thousand years, enjoyed a unified and complete civilization, far exceeding the acquisitions of contemporary western peoples. Its capital developed an artistic magnificence, whose dazzling splendor exercised an even magical effect upon the crusaders from the West.

II. Evolution of the architecture and the monuments.

The centre of architectural activity lay in church architecture, as during the Early Christian period. For it was determinative the central building, at first indeed in the form in which it was represented in S. Sophia and the works of the 7th century. In the later period it experienced many changes, which however brought no substantially new tendencies into the treatment of interiors, but chiefly related to the structural problems of the substructure of the dome. The joyful formative

creative power of the western middle ages found no counterpart in contemporary Byzantine architecture. Likewise where the latter was transported by commercial relations farther to the West on another soil, as to upper Italy and Sicily, it passed into no notable advanced development. Only the peoples of the East, recently converted to the Greek church in Armenia and Russia, developed peculiarities, that chiefly related to the domain of ornamentation.

The ground plan of the Byzantine church in the arrangement of the interior follows the design already given in the previously mentioned Early Christian churches at Thessalonica, Myra, Ancyra and Cassaba (see page 166). For the main interior the form of the usually regular Greek cross with short transverse arms is determinative (Fig. 210). Before this lies on the West a single or double narthex. The eastern arm of the cross is extended by the presbytery, which ends in an internally circular, but externally often polygonal and projecting apse. The two side arms of the cross are no longer separated by colonnades from the middle area, but remain open. They are connected with the corner rooms lying on the entrance and altar sides, so that these appear in a certain sense as side aisles. The latter terminate at both sides of the altar space in the pastophon, which open into the presbytery and project into this, on the left (northern) side as the prothesis for the keeping of the sacred vessels and the presentation of the consecrated gifts, opposite (South) as the diaconicon as a sacristy. The presbytery thus widens into an interior in three divisions. To obtain a better separation of the sanctuary from the middle space intended for believers, the choir screens were extended to colonnades with entablatures, from which was finally derived the iconostasis, the closed wall with reliefs, which removed the sacred service from the eyes of the multitude. Through its middle doorway only the priests had admission. Since by the omission of the colonnades in the transverse areas small space remained, galleries became ever more rare, and they were finally limited to the inner side of the narthex. By this arrangement the ground plan in its external outlines received the form of a rectangle or approximate square, adjoined at the

entrance by the wide narthex and on the other side by the apses. Some churches also expressed on the exterior the Greek cross form by the projection of the transverse arms beyond the external side walls (as for example at the monastery church at Scripu in Boetia, and in a less regular grouping at S. Marco in Venice.).

These typical forms of ground plan of the Byzantine church were fully developed toward the end of the 8th century. It stands in intimate relations to the arrangement of the domes, not only determinative for the internal impression, but also for the external effect. Among these the great central dome over the middle square occupies the dominating position, to which the side domes are subordinated. These rest chiefly over the square rooms in the four angles of the transverse aisle and the narthex, also frequently over the pastophoreion, less commonly above the transepts themselves (S. Marco in Venice), whereby the Greek cross is expressed in even the arrangement of the domes.

For the structure, the most important problem consisted in the vaulting of the rooms and before all in the construction of the main dome and its substructure. For this new solutions were developed in time, that again reacted on the form of the ground plan. The heavy piers at the angles of the square, retained from the Early Christian period, were soon replaced by four columns, which were sufficient for the most modest dimensions (see the ground plan of the smaller church in Fig. 212). Arches of wide spans support the superstructure of the dome and connect these columns, and smaller arches extend from these to the external or transverse walls. This system with four columns is already found in the church of the Madonna (S. Theotokos) built about 800 at Constantinople. (Figs. 210, 211).

For a series of monastery churches the larger domical construction in the catholicon of the monastery of S. Lukas in Phocis became typical. (Fig. 212). Here the central area in the ground plan is indeed square, but is transformed into an octagon above by trumpets, i.e., stepped corbellings of the angles, on which rests the dome. The load is received by 12 piers, of which four stand at the angles of the square with two others

at each side beneath the angles of the inscribed octagon. By the arches that extend between the piers themselves and between the piers and the enclosing walls, the thrust of the dome was transferred to the outer walls, so that a technically excellent construction was obtained. It brought a visible advance, since the middle area was undivided by columns or piers, and its entire width extended before the triply divided presbytery. (Compare in Fig. 212 the ground plan of the larger church with that of the smaller). For more modest proportions the dome itself might even be placed on the walls of the church. From this plan was derived the simpler system with 8 supports, that in manifold variations found general employment, especially in monastery architecture.

While in the ground plan the central idea recedes by the arrangement of the rooms on a longitudinal axis, this becomes the more strongly emphasized in the structure, since the main dome was carried considerably higher, when it was set on a cylindrical or polygonal substructure, the drum. (From the 9th century onward). This drum forms the most important innovation in Byzantine architecture. It provides a very peculiarly adapted place for locating windows, that led an extremely favorable light into the principal internal room. The side domes likewise received such a drum with a corresponding subordination to the main dome. The remaining covering of the interior followed in the manner already practised in the Early Christian period, so far as domical vaults were not also employed. The cross arms adjoining the middle domed room were spanned by wide tunnel vaults, and the transepts by tunnel or cross vaults.

The technics of the execution exhibit only unimportant innovations in comparison to the Early Christian mode of construction. In the external masonry appears a great preference for a variegated animation of the surfaces by the alternation of red bricks in courses with chiefly yellow ashlar in continuous horizontal courses and regular bond. Thereby is not only produced a very expressive and picturesque effect, but is also created a quieting and equalizing contrast to the animated lines of the arches and domes. (Fig. 213). The vaults are mostly executed with thin bricks and thick mortar joints. The Byzan-

Byzantine masons prepared their mortar of such excellent quality, that in certain monuments the dome still holds together, even with a partial fall of the substructure.

The architectural treatment is indeed based on the antique treasury of form, but composes the elements taken therefrom in such a free manner, that the classical prototype is scarcely recognizable. As external architectural members occur almost wholly rare, slightly projecting and bluntly profiled belts and similar main cornices, together with blind arcades and niches, which at the same time have the problem to afford a reduction of the masses of the walls. About from the 11 th century onward appeared the endeavor to gracefully animate the facades by zigzag bands (especially on the arches of windows and doorways), frets, relief slabs, brick friezes and band patterns, composed of glazed bricks of various colors. The round arches at the doorways and windows were preferably stilted (furnished with vertical imposts). Frequently occur horseshoe as well as pointed and keel arches in their place. In the later period the windows continually became narrower, first in the drum and then also in the enclosing walls, until they finally appear only as high and narrow slits in the wall, enclosed by mouldings. On the drum, they are flanked by round columns, that frequently support the often strongly projecting arched caps over the windows. These are directly intersected by the dome without a cornice at its base (Fig. 214). The arched caps thus form the uppermost crown of the drum, extending around the drum with animated movement. The motive expressed by them was also finally transferred to the facade surfaces, in which occur round and segmental arches as a free termination of the external walls in a new appearance. The spandrels of the domes and vaults at first remain plain as at the church of S. Sophia. Later the spandrels are so decorated by bricks, that the hemispherical form of the dome still appears. In certain cases the drum is crowned by a pyramidal roof to protect the dome. Then the tunnel vaults receive gable roofs over the cross arms, over the side rooms being low shed roofs sloping from the internal walls.

The decoration of the interior (Fig. 215) does not proceed by architectural relief ornamentation of the walls and surfaces

of the vaults in the antique sense, but by a rich ornamentation with varicolored marble facings, mosaics and paintings. As architectural members are properly found merely columns with weakly profiled archivolts and similar impost mouldings. The capitals of the columns exhibit in the first period the trapezoidal and enlarged upwards Byzantine-Early-Christian form or that of a basket-like block, reduced or rounded off below. Later flower corollas with classical reminiscences were preferred, on which were placed sharply cut acanthus leaves in pattern-like forms and play of lines, and in very flat relief. (Fig. 216). The shafts of the columns are diminished without entasis, and the bases vary but little from the antique models. On the pavements extend marble mosaics in geometrical patterns in lavish abundance and magnificence. The lower portion of the walls is covered by marble slabs, the upper part and the undersides of the vaults are most splendidly equipped with mosaics of glass rods, that monumental mode of ornamentation, that was already practised by the masters of the Early Christian period, but which was particularly suited to the Byzantine by its heavy magnificence and the rhythmic restraint. They brought this branch of art to high perfection and developed in it a peculiar style required by the strong subordination to the rules of the church, whose influence upon western art is perceptible until our own time. Where the use of the costly ornamental and figure mosaics was inadvisable for lack of means or for other reasons, fresco paintings appeared instead in quite the same mode of conception and execution.

In the ornament is expressed still the imitation of the textile character of ancient oriental art. Its basal elements are geometrical forms and conventionalized scroll-work, that in the first period permit recognition of many similarities to early Grecian ornamentation, but assumes a severe and pattern-like form in the lifeless and rigid treatment of acanthus leaves. In the scrolls and figures are interwoven many Christian symbols, besides generally the Greek cross.

Since the exhibition of statues was forbidden by the church, sculpture found zealous culture only in the domain of the minor arts, in ivory carving, attaining great fame therein. On the few architectural monuments, that also exhibit relief slabs,

these scarcely appear except as enlarged transfers of ivory r reliefs to stone.

The most important monuments are:- in Constantinople; S. Theotokos (church of the Madonna), built about 900 (Figs. 210, 211), a regular plan with 4 columns and a doubled narthex widely projecting, a main and four side domes (the latter over the narthex), the exterior in a very expressive treatment: the pantepoptes church with but one dome, and the similarly planned Pantocrator, both of the 11 th century, the latter as the burial place of the Comnenes dynasty (1057-1204), enlarged by several additions; the church of the Saviour, particularly important, since its complete decoration in ornamental and figure relief, marble facings, mosaics and paintings, has been preserved until our time, while all other churches have lost their ornamentation through the enmity of the Turks toward figures.

In Trapezunt:- the church of S. Sophia, ground plan with 4 columns and portico, internal narthex and two side wings as a additions to the arms of the cross.

In Thessalonica:- (Salonica); the church of S. Bardius with entirely regular ground plan according to the scheme with 4 c columns, and the church of the Apostles, completed in the 11 th century, where the inner narthex also extends along the sides about the interior with 4 columns; the drums are proportionately high and are richly subdivided. The church of S. Elias (Fig. 217) was built in the year 1012 and so far differs from the rule, that its side transepts also terminate with a semicircular apse.

In Athens are several churches, among them the Panagia Gorgiko (old cathedral) affords particular interest by the rich relief ornament on the facades, and the splendid S. Eleutherios recalling strikingly even on the exterior the internal subdivision and the Byzantine style, from the beginning of the 9 th century. (Fig. 218).

Great importance for the ecclesiastical life of the East was secured by the monastery plans, and among them especially the monasteries built since the 9 th century on Mt. Athos on the northern coast of the Aegean Sea. In them were gradually developed fixed rules for the plans of monastery buildings, the arts were zealously cultivated, and indeed not merely during

the actual flourishing of Byzantine architecture, but likewise in the period of decay and even under the Turkish rule. Until the present day are they preserved as a monastic republic with 20 fortified walled monasteries and as a chief location of Byzantine art methods. Of the numerous monastic churches, that at Scripur in Boetia (built 873-874) with low dome and tunnel vaults over aisles and narthex, as well as the catholicon of S. Lukas in Phocis have already been mentioned. With the latter agrees in the ground plan the monastery church of Daphni (11 th century) and S. Theodore in Misitra (1296; southern Greece). The system with 8 supports is represented by the catholicon of the monastery of Nea Moni on Chios, and by the church at Crina influenced by it, interesting for its animated arched and blind arcade architecture with brick ornamentation.

Likewise outside the Byzantine empire, some purely Byzantine monuments originated in the provinces of Italy, either dependent on or influenced by animated commercial relations, in Palermo being the little church of S. Maria dell' Ammiraglio, called Martorana (founded 1147), in which the round arches are replaced by pointed ones (see Vol. 2), at Stilo in southern Italy being La Cattolica, and in Venice the famous church S. Marco, the greatest creation of Byzantine architecture in the middle ages. On the site and utilizing certain parts of an earlier basilica, burned in 976, built in the 11 th century and dedicated in 1094, it bears all the marks of a consistently executed Byzantine central structure; ground plan of the Greek cross with side aisles cut off by arcades, domes over the middle area, the arms of the cross and the single narthex, that is also extended along the sides to the transverse aisle and covered by small domes. (Fig. 219). The internal decoration (Fig. 215) refuses the effect of architectural members in relief and places chief value on the covering of the lower parts with precious and brightly colored marble slabs, on the rich contrast of variegated columns with gilded capitals, and the ornamentation of the upper portions with splendidly colored mosaics shining with gold in an oriental and even fabulous richness. The unity of style is not retained, since even in the 17 th century work was carried on for the external and internal

construction. The grand portals treated in Lombard-Romanesque style with columns and arches (Fig. 220) belong to a rebuilding dedicated in 1094; the free round arched terminations over the deep recessed niches of the vestibule were also still decorated in the 14 th century by Gothic recessed arches and crockets.

An interesting architectural group of western Roman-Early Christian and Byzantine art is composed of the cathedral and S. Fosca on Torcello near Venice. (Fig. 221). The cathedral dates back to the year 650 in its ground plan. But to the ancient structure belongs only the principal apse, in which the seats rise as in an amphitheatre (with reference to the annular passage beneath them to the confessio, see page 179, which could not be placed lower). The rebuilding followed in 864. S. Fosca is a Byzantine central plan deserving consideration by its beautiful treatment of the Byzantine central plan, of which the originally projected dome was never executed. The octagonal central area is still covered horizontally. The exterior permits a clear recognition of the Byzantine architectural scheme. (Fig. 222).

In the Danubian provinces the two transverse arms of the cross are chiefly extended by apses. (Churches at Semandria, Ravonica and Krusevac in Serbia). The church at Kurtea d'Argyisch in Wallachia was already under the predominating influence of Russian art.

Numerous smaller monuments are found in the Asian provinces of the eastern Roman empire, especially in Asia Minor, in some parts of Syria and in Palestine. The Byzantine architectural style has remained until the present time determinative for the religious buildings of all nations, that belong to the Greek church.

Of Byzantine secular architecture only a relatively small remainder of noteworthy monuments have remained until our time. Even in the capital, once so rich in magnificent secular structures, are only a few unimportant remains to be found now, among these being the three story hall building of the Tekfur Serai, dating from the first half of the 9 th century, a ruin, whose enclosing walls are yet standing with the front facade, undivided but animated by round arched doorways and windows,

and further the so-called "Chambers of Anemas", a vaulted structure 196.9 ft. long and utilized as a prison for the great men of the empire, also a great number of towers belonging to the mediaeval fortifications of the city.

In this place we shall also mention the problematical mashi-ta (meschatta, maschitta) structure, even if its place in a definite period appears uncertain in time as well as in style. (The facade is now in great part exhibited in the Berlin Museum). It lies on the great caravan route from Damascus to Mecca, about 31.1 miles east of the northern end of the Red Sea; it was probably erected as a caravanserai (see page 207) or as a desert castle and remains unfinished. A square area 508.5 ft. on each side is enclosed by high walls, which are strengthened and defended by 23 semicircular towers, only containing an entrance at the middle of the southern side, flanked by two polygonal towers. In the interior a number of rooms lie directly behind the portal and opposite the northern wall in symmetrical grouping about the middle axis, and whose purpose is doubtful. High interest is afforded by the splendid ornamentation, sculptured in very low and graceful relief at both sides of the entrance on the towers and the surface of the walls for a length of 150.9 ft. and to a height of 18.0 ft. (I.e. of the entirely constructed wall). It chiefly consists of compact vine scrolls, that chiefly grow out of vases and with interwoven animal figures fill the triangular panels, arranged in a continuous series. (Fig. 223). The drawing and execution are very peculiar, but is nearest the Grecian-Oriental ornamentation, permeated by Neopersian motives, such as were employed as a late offshoot of antique art in Syria and Palestine, particularly from the 4th to the 6th century and later, even until in the time of the crusades. It influenced strongly not only the Byzantine-Early-Mediaeval art of ornamentation in Constantinople, but also that of the East; where its influence is still evident in a series of monuments in the 12th century. To the same series of forms among others belong the ruins of the so-called Kasr il Abjad, or white castle in the Rubbe, still lying about 62.1 miles north of Mschatta.

Offshoots of Byzantine art in Asia Minor, the Caucasus and in Russia.

The churches in the west Asian provinces on the Black and Caspian Seas, in Armenia and Georgia exhibit in plan, construction and the treatment of details in many ways an independence from Byzantine style of architecture, and partially even react upon it. They have modest dimensions, are arranged in cross form, which may also be recognized on the exterior, while the central room above the arms of the cross is carried higher. But the Armenian cross differs both from the Greek and the Latin cross in that, the western and eastern arms are equal to each other, but are longer than the transverse arms. (thus the cross bar of the Latin cross is moved to the middle of the longitudinal bar). Over the central square rises the drum with the dome. This is always covered by a high conical roof. The abses generally do not project externally, but the rear wall is straight as in the Syrian churches. Only sharp triangular recesses on the exterior indicated the places, at which the internal choir rooms are separated. To the Syrian examples also corresponds the predominating covering of the interior by tunnel vaults. In the internal equipment is preserved great simplicity. The narthex is omitted as a rule. The portals are made small and low. From the contact with Persian and Arabian art is derived the use of round, pointed and horseshoe arches. The external walls rise above a plinth in three steps, are subdivided by blind arcades on slender and frequently coupled half columns, and are almost always constructed of ashlar. The general appearance of many churches often strikingly resembles that of the Romanesque buildings of the West, both on the exterior and in the interior.

Monuments:- The ruins of the cathedrals of Ani and Coutais with great blind arcades on the surfaces of the external walls. The church in Pitzounda, arranged according to the normal Byzantine ground plan and indeed with narthex and gallery. The stately monastery church of Etchmiasdin, whose all four arms of the cross are extended by apses projecting externally, and the church of S. Rhibsime at Wagarschabad with a very rich development of the cross-shaped ground plan by extending each a

arm of the cross by a semicircular niche and the placing of square rooms in the angles, so that externally is produced a closed rectangle, the internal apses only being indicated by triangular recesses.

In Russia at about the end of the 10 th century, the Greek Catholic church found entrance from Byzantium and with it the Byzantine church architecture. Until then Russian architecture, always under foreign influences, had adopted in the South western Asian and Hellenistic-Roman traditions, but in Great Russia the northern wooden construction through the Scandinavians. * During the approximately 250 years of the Mongol rule (1238-1480) were determinative the art ideas of inner Asia and its world of form, which subsequently gave to Russian architecture its peculiar character.

** The Varags, a Swedish race derived from the Normans (see Vol. 2, page 1), in the 8 th century invaded the coast provinces of the Baltic Sea, founded the Russian empire in 882, but gradually fused with the Slavic people and adopted their language and customs.*

The Byzantine scheme of plan was the basis of the churches, but is frequently so changed by the separation of subordinate rooms and by additions, that the unified effect of the interior is lost. The presbytery is entirely separated by a solid iconostasis from the remaining interior of the church; this mostly appears depressed and badly lighted. In the ornamentation by mosaics and wall paintings, men firmly adhered to Byzantine traditions. Still in them was not seen the artistic centre of the church building, but in the showiest possible external treatment. Instead of the earnest monumental appearance of the Byzantine House of God occurs a loose and luxuriant architectural surface, for which men indeed adopted the motive of the dome and utilized it in a lavish way.

From the low and massive body of the building rise a multitude of partly stunted and partly slender towers, that all have domes in the most varied and wonderful forms. The form most generally preferred is that of a bulb, that is swelled out in the form of a balloon, so that the drum beneath it only appears as a thinner necking. These bulbous domes even crown the spires shaped as steep pyramids. (Fig. 226). For the other

covering is in use the hip roof derived from wooden construction. The transition from the square or polygonal substructure to the dome extending through the roof is frequently made by small dwarf gables, arranged in rows behind and above each other. (Fig. 224). They correspond in a certain way to the internal construction under them, in which a system of stalactite arches placed above each other effects the transition from the square to the polygonal or circular form of the drum. The extremely effective and alternating rich covering of the roofs and domes with brightly colored faience and partly or entirely gilded metals gleams afar in the most brilliant colors.

For the subdivisions of the walls, the portals and decorations the Armenian models continue in use in the first period. The architectural details later experienced a thorough transformation. Swollen cornices, swelling members, bulging capitals, luxuriantly fanciful decoration with heaping up members and overloading the forms permit the recognition of Chinese, Indian, and especially Persian influences. (Fig. 225). Architects, attracted or called from the West to Russia, particularly from Germany or Italy, also enriched the treasury of form existing there by details from their native art. Still they composed in accordance with the orders of their employer entirely in the style of the Russian creations. Wide and many-membered cornices, coffin-like wall panels and friezes, the ogee arch as the prevailing form of arch for window and gable caps, (see Fig. 226), the hip roof and the bulbous dome form its most important characteristics.

Likewise secular architecture received by them its specific stamp. (Fig. 227). On the wooden peasants' houses in middle and northern Russia, one meets with very charming sawed, perforated and carved enclosures of doors and windows, barge boards and the like, which in details frequently echo the form elements of the Romanesque West.

The Russian ornament lacks unity in character. Everywhere local and contemporary diversities may be detected, which were compelled by the crossing of native ornaments with foreign decorative tendencies. The basis is composed of geometrical interwoven work in connection with interlaced bands and animal o

ornamentation (see page 10, 171), which as a common possession of the Germans, Scythians and Slavs dominated prechristian art in all middle Europe and the East from the provinces of the Caucasus to Siberia. To this are added chiefly Persian and Hellenistic-Roman motives, transmitted in the Byzantine spirit, whose play of lines may often be very clearly recognized in the continuous bands and friezes. Certain Renaissance and Barocco motives, that penetrated in the 17th and 18th centuries, further became a paramount part of the Russian ornament of the later time.

Monuments:- until the beginning of the 13th century the Byzantine or Armenian influence is predominant, thus on the two cathedrals of S. Sophia at Kief (1037) and Nowgorod (1052). On the church of S. Maria Helper of the monastery of Bogolintow near Wladimir built in 1155, an acceptance of the contemporary architectural forms of the West makes itself perceptible in the detail forms, so that the exterior seems entirely Romanesque. Likewise at the monastery church at Sfusdal, erected in 1176, as well as the famous cathedral of S. Demetrius at Wladimir (1195), this is true of the details. Yet in these two churches the native architectural style already appears in a more striking way. The transition to the proper Russian style characterizes the church of S. George at Jurjew - Polski (1234), at which chiefly Persian models influenced the ogee arches, the bulbous dome and the relief work of plant scrolls.

222 About the end of the 15th century two Italian masters constructed important churches in Moscow; Aristotle Fioravanti from Bologna the church of the Ascension (coronation) of Maria in the Kremlin from 1475 to 1479 (Fig. 227), with five domes, slit windows, round arched gables, dwarf galleries, etc., and A Alexio Novy (1489-1508) the church of the Annunciation begun by his countryman P. Antonio Solari (+1493), crowned by eleven domes (see Fig. 227 at the rear on the left). Foreign influences are expressed in these works only in the details of the ornamentation.

The 16th century brought the best period. Cities flourished and acquired particularly by their kremlins, the unwall'd sacred hill, on which were crowded churches and palaces, their national Russian architectural appearance. In the year 1554

under Ivan IV (the Terrible) was begun the most expressive work of Russian art, the church of S. Basilus in Moscow. To the architect, a Russian, fell the problem of grouping in two stories eight sanctuaries around a central larger room. He made the separate chapels polygonal, connected them by passages and adorned them richly by paintings. On the exterior (Fig-228) his artistic taste, based on Asian-Barocco showiness, created an architectural form of the most luxuriant caprice. The church of S. Basilus thereby became the representative wonder work of the Russian art.

To the 17 th century belong the two churches of the Madonna at Moscow and at Markova near Moscow. They are designed in somewhat more quiet and clear proportions, but lose in their external appearance by the too frequent repetition of the dwarf gable forms.

In the 17 th and 18 th centuries western civilization and western art were transplanted to Russian soil under the monarchs of the House of Romanoff. The religious and secular buildings of the new capital of S. Peterburg, founded by Peter the Great (1689-1725) were erected by French and German architects in the contemporary architectural forms of the West, and other cities followed this example. First in the modern period was again expressed a return to the national art style, particularly to the picturesque wooden construction of the early Slavic middle ages.

2032. XII. The Architecture of Islam.

1. General and historical Basis.

Entirely without mediation and preparation, almost like a suddenly appearing elementary event broke in the political transformations introduced with the announcement of the religion of Mohammed. With fanatical inspiration the principles of the new faith were adopted by the Arabs, and their commands were consequently strongly enforced by the sword. But 35 years after the first appearance of the prophet (622), his followers had entirely conquered Arabia, Syria, Palestine, Persia, Egypt and Cyrenaica, and soon afterwards the remaining part of the northern African countries fell into their power, and finally also Spain (711) and Sicily (827). In the 12 th century Islam pressed farther eastward and brought all India under its rule. At the middle of the 15 th century, it also extended into southeast Europe, conquered Constantinople (1453) and permanently took possession of the Balkan peninsula. It thereby included a domain larger than the former world empire of the Roman Caesars, and ruled over masses of peoples, that were very irregularly endowed, but were only held together by the common bond of the Mohammedan religion.

Consequently the architecture of Islam presents under the different climates also very diverse forms. When the Arabs passed the frontiers of their native land and subjugated in rapid and victorious campaigns the oldest and richest civilized countries of the world, the splendid Neopersian kingdom of the Sassanides, Byzantine Syria and the Roman provinces of northern Africa, they were themselves still chiefly nomads, dwellers in tents, to whom a native architecture was wanting. Therefore they adopted the forms found in the different countries and gradually filled them with their own life. Only after two centuries was attained the originality characterizing Islam. This however has not received its purpose in a sense from the religion, like the case of the Christian art. For the Mohammedans knew no altar service; afterwards as before the Kaaba in Mecca formed the true sanctuary. Toward this were directed their faces, when they said their prayers, according to the command of the prophet. The House of God should indeed a

afford a place for common prayers, and for these was required only a covered hall, in which was particularly indicated the direction toward Mecca. No binding precepts existed for the construction and arrangement. Consequently the faith led to no new creations in regard to the treatment of the interior and of the forms. Likewise in its other architectural works has Islam produced no independent architectural types. What appears new and peculiar in its art, substantially consists in the free conception and transformation of the forms occurring, in the technical treatment of certain standard materials, and especially in the wonderful decorative system, that the specific purpose of Mohammedan architecture determines, lending to it unexcelled beauty in many respects.

II. Evolution of the architecture of Islam and the monuments.

Among the architectural works the houses of prayer, mosques, occupy the first rank. In the first period men were satisfied by the direct change of churches and synagogues into halls of prayer. In new buildings two chief forms were gradually developed for the ground plan. The first (Fig. 229) is a rectangular court (sahn-el-gamia), at the centre of which stands the fountain of purification for the ritual ablutions, surrounded by open porticos, one of these, generally that toward Mecca, being arranged with much greater depth as the proper hall of prayer (liwan). In it the direction toward Mecca (kibla) is indicated by a niche (mihrab) recessed in the outer wall. This prayer niche takes the place of the sanctuary; it is ornamentally treated with especial richness. (Fig. 230). Beside it stands the pulpit (mimbar), set according to the depth, a latticed platform, from which are read the words of the Koran and repeated to believers standing further behind. During divine service the koran, the sacred scripture of the Mohammedans, lies open on a low desk (kursi). For the caliph or his representative is also constructed a latticed box (maksura). The entire liwan makes the impression of a hall of columns, uniformly subdivided by a great number of rows of columns of equal diameter and height, with connecting arches and arcade walls, on which rests the horizontal ceiling.

The second principal form of the mosque adopts the plan of the Byzantine central building, either in the simple form as a polygonal domed room with outer aisle as at the so-called Dome of the Rock (Sachra mosque) at Jerusalem, or in the compound system of S. Sophia. The latter is the classical model for most of the Osman buildings at Constantinople and in the remainder of Turkey, either with a direct transfer of its structural system, or with a change so that four half domes lean against the central main dome. To the completion of the plan of the mosque also belong the minarets, slender and tall towers, from whose balconies the muezzin announces the hours of prayer. (Fig. 231). They mostly stand beside the gateways, but are without organic connection with the structure.

The mosques with high schools (medresses), where four large vaulted prayer rooms with open inner ends lie around a court in the form of a cross, its arms serving both as liwans as well as class rooms for the four rites of the Mohammedan faith. Around this building as a nucleus are grouped numerous apartments as living and administrative rooms. (Fig. 232).

At the tomb mosques the hall of prayer is reduced somewhat in magnitude with a form of plan otherwise similar. The simple mausoleums chiefly contain only one small internal room of square area. They are crowned by a massive dome. (Fig. 246).

Of the other structures connected with Mohammedan civilization, the sebil denotes a fountain house above a richly treated rectangular room with water basins for supplying water to passers; the Tekiye is a design corresponding to our monasteries, the moristan being a hospice and hospital. The last two are extensive groups of buildings in cellular arrangement about one or several courts in connection with a small mosque.

207 Likewise the Khans or caravanserais erected in great numbers on the caravan routes as public shelters exhibit the uncouvered court plan with a generally regular (square or polygonal) enclosing structure, that contains on the inner court side the lodging and cooking rooms with the stables, but is entirely closed on the exterior with the exception of the monumentally treated portal.

At great expense were built the palaces of Mohammedan monar-

monarchs, both as residences and seats of government, as well as external tokens of political power. They lie within an extremely well protected and fortress-like enclosed area, in which the structures for court purposes, the women, dwellings of officials, for the military etc. are always freely grouped with a mosque in the midst of carefully tended gardens, parks for animals, grottos and the like. The chief buildings, the alcazar, generally has a symmetrical plan in the form of a rectangle, that contains at the front a narrow vestibule extending the entire length of the building, behind this being a great middle room occupying two stories and enlarged on all four sides by rectangular niches (Fig. 233), supplied with clear spring water and richly equipped with fountains and water basins. Right and left of this grotto hall lie the subordinate rooms, but in the third story the principal apartments have a similar ground plan. The reception and audience halls were almost always found outside the proper alcazar and in the midst of the park. (Fig. 234).

The citizens' dwellings permit the recognition of the basal traits of the Roman house by the arrangement of the rooms around uncovered courts, furnished with water basins and spring fountains, in which a complete separation between the men's and women's living rooms is carried out. It is the case in a still greater degree, than in the Roman house, that the Mohammedan is enclosed externally and against seeing by angles in the house corridor, omission of windows toward the streets, or in case these are indispensable, by most carefully protecting them by close lattices.

For building materials there come into consideration for the erection of these architectural works in great part the materials already in common use in the different countries, natural stones and bricks, especially granite, limestone, sandstone, airdried and burned bricks. Where good building woods existed in sufficient abundance, as in Spain, Turkey, in Asia Minor and India, these were added. Gypsum plays an important part in the architecture of Islam, both for ornamental sculptures as alabaster, as well as for casting arches or for stucco and plastering, with ceramic products in colored glazed bricks, clay slabs and tiles. But the latter were already known to t

the ancient Egyptians, Assyrians and Persians, yet were brought by Islam to higher perfection, both as relief slabs, on which the ornaments were incised with a free hand or overlaid in thin strips and then enameled, i.e. covered with a glaze, as well as (after the middle of the 14 th century) smooth plates, painted and having a metallic lustre, the so-called faience. Its use was so general in some countries, particularly in Persia, that not only on the mosques, but also on the better private houses, the internal floors and walls and even the external surfaces of the facades and domes were entirely covered with them. Besides there are also found (chiefly in India and Egypt) marble wall slabs and those of other noble stones, as well as marble mosaics on floors and on the walls, further with wooden panelings with inlaid work in costly woods, ivory and metals for internal walls and ceilings.

Building procedures exhibit in general an adoption of the methods of treatment practised before the invasion by Islam. Yet the solidity of Syrian and Roman works was not reached in the jointing of ashlar and the construction of walls and vaults. The entirely untrained sons of the desert had no time in their temporary campaigns of conquest to devote themselves to such problems. Not rarely was the execution as hasty, as if the buildings were only intended for the present. For masonry was never developed a special bonding, peculiar to the Arab style of architecture. Generally stretchers and headers alternate in the same course, when the stones are laid alternately parallel and perpendicular to the face of the wall. Otherwise the embleton of the Romans (see page 105) is the most common construction of the wall. By the insertion and anchoring with wooden timbers, men sought to increase the resistance. In Spain half timber construction with a covering of stucco is the prevailing mode of construction. The walls above arcades were there chiefly constructed not of masonry, but framed with timbers and laths, on which slabs of stucco, cut out in arched form, were fastened as a covering. The ceilings consist of whole or split trunks, usually of palm trees, if they are horizontal and are built of wood, with a partial or entire sheathing of the undersides and panels, over this being a layer of boards and thin stones for the covering of the upper floor.

In the Hauran is retained (see page 161) the previously described construction of horizontal ceilings of stone slabs. Among vaulted ceilings the domical form stands in the foreground. Yet there occur nearly all forms of vaults employed by the Persians, Byzantines and Romans. They are executed in bricks, cut stone, quarried stone, cast in gypsum and even in wood in certain cases, (Dome of the Rock at Jerusalem), the domes frequently with double vaults, higher outside and lower inside, with wooden stiffening bars in the space between them. The vaulting lines change with the country. For buildings in North Africa and Turkey the Byzantine hemispherical dome is characteristic, in Egypt and Syria the stilted and pointed dome, and in Persia and India the bulbous or pear form, derived from the oggee arch. (Figs. 236, 246, 252).

With the forms of the vaults are reckoned further the mokannas or stalactites ("drip stone forms"), exclusively belonging to Mohammedan art. These are explained as being originally a peculiar development of corbelling in pendentives, so that the different stones were set above each other in form of triangular prisms, and hollowed out below or rounded off in spherical pendants. (Fig. 235). They are not only found in vaults, but also as a transition form under nearly all projecting architectural members, in the small niches, under the cornices, on capitals as a transition from the round column to the square abacus, and finally in entire designs of ceilings as cellular vaults, that recall stalactite formations. On the facades they are usually in cut stone or terra cotta, but in the interior are constructed in gypsum and suspended in wooden construction. These stalactites first occurred in Egypt before the first half of the 12th century, but finally in a purely ornamental form became a chief portion of the Mohammedan treasure of form. (See Figs. 230, 231, 233, 239, 250).

In a still higher degree than in the construction, the architectural forms omit the static feeling for the structural problems of the different architectural members and their relation to each other. To the unstable and unrestricted imagination, always directed to the fabulous, corresponded the gay and picturesque representation of a strange treatment, far more

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than the rythmical proportions of the Grecian-Roman temples and palaces. Therefore they followed the models transferred therefrom with ever greater freedom and placed them finally under a peculiar law dictated by themselves. The centre of gravity of the artistic development is placed entirely in the internal architecture, while the exterior, at least in the provinces around the Mediterranean Sea, is left strikingly simple and without ornamentation.

The facades (Fig. MC-U but seldom receive an architectural subdivision. The plinth elsewhere usual is wanting, likewise a subdivision of the facade in stories by horizontal belts etc. Only smooth and band-like projections are arranged and break the faces of the walls. But the wall surfaces themselves are adorned by artistic ashlar courses, network bands of brickwork, flat ornamented bands and also (in Sicily) partly decorated by blind arcades, and animated by doorways, windows, niches and bay windows in rich alternation. The portals were always large and monumental with the characteristic arched top, and richly treated with niches and stalactites. The ornament rises here to choice magnificence (see Figs. 236, 237, 250). The niches show a similar treatment at a correspondingly reduced scale. At the windows the arches received an extremely varied play of lines. Already on the early buildings one meets with combinations into double windows, frequently with round openings in the tympanum, and likewise the so picturesque and effective rows of windows with dwarf columns. The upper termination of the surfaces of the facades is formed of a but slightly projecting main cornice, often with a row of battlements extending above it, but whose forms recall less the steps of gables than upright standing leaves or sawed out and carved woodwork. The roofs in Syria and Egypt are mostly flat, consisting of stone beams or palm trunks with a layer of mortar, but in Spain and also in part in Sicily according to antique methods, formed of rafter construction with flat and hollow tile covering. Elsewhere prevailed the domed roof, especially in Persia and India. The external surfaces of the domes remained either plain and without color, or they were richly decorated by incised or carved clay tiles and by enameled mouldings and

network. Copper terminals with spheres, rings and half moons placed above each other form the crowning ornament.

The internal architecture is characterized as a purely ornamental architecture of columns and arches in combination with stalactites, and an extremely rich and splendid ornamentation of the walls. The columns were at first taken from antique or Byzantine structures, and these were also superficially imitated and set confusedly in a varied way. Only after considerable time appeared peculiar forms of columns, which seem to be influenced by the national recollections of the nomadic tent. The base is usually wanting; but if it is developed, then it appears rather as a bell-shaped swelling or cavetto-like enlargement of the shaft. (Fig. 238). This is always thin and slender, without diminution or entasis, with some rings around the base and several encircling neck bands. The capital either consists of an astragal, long necking with leaves, a richly ornamented block, rounded off below, and an abacus, or it shows the expressed Mohammedan angle transitions by means of stalactites. (Figs. 238, 239). The abacus projects strongly, or there lies on it (as in certain monuments of Byzantine art), a trapezoidal impost block, enlarged upwards to receive the frequently incurved arch. (Fig. 241).

In the arch forms is expressed the joy in animated and rich play of lines, in strange and fanciful treatment. The simple semicircular arches, which play so great a part in Roman art, are almost entirely omitted; at least they appear stilted, i.e. raised on vertical imposts. Most commonly appear the pointed arches, the horseshoe and ogee arches, and indeed -- corresponding to the similar vaulting lines of the domes -- the pointed arch chiefly in Egypt, the horseshoe arch in north Africa and Spain, the ogee arch in Persia and India. To these are added the forms composed of circular arcs, the trefoil and foiled arches. (Fig. 240). The archivolts are especially emphasized, less by moulded enclosing members, than by treatment in different colors and decoration of the voussoirs, or by a continuous broad band of ornament (inscription). Yet these arches do not usually appear as if supporting structural members, but they are turned between vertical wall bands, that rise fr-

23 from the abacus of the capitals and are continued above as horizontal bands beneath the termination of the wall. (See Fig. 249). The arches were frequently set in two series over each other, the lower one then open and without a wall built over it. (Fig. 241). The arches frequently intersect and interlace, whereby a wonderfully luxuriant arcade construction is produced. Thus the severe architectural motive of arched construction is directly converted into an ornamentally conceived element of decoration.

On the arcade walls rest the ceilings, treated either with visible beams and wood carving, frequently coffered or entirely flat with netted ornamentation, or especially for the smaller and particularly lavishly equipped rooms with the stalactite vaults. The floors were animated by mosaics of marble or clay tiles.

24 The principal emphasis of the internal decoration always consists in the ornamentation of the wall surfaces. By the before mentioned vertical bands, the wide head band, the arches, the impost frieze, by dividing and enclosing ornamental borders and bands of inscriptions, these surfaces receive a kind of subdivision by enclosing and frieze bands. On all flat surfaces is then developed a peculiar and wonderful ornamentation, such as can only be attained by technics carried to the highest point, particularly in ceramics and the trowelling of stucco. Since the patterns were chiefly incised in clay and stucco - not moulded - , they won the direct effect of artistic hand work.

The ornaments (Fig. 242) are partly executed as distinct panels, partly as continuous band patterns, or are entirely unlimited (in unending ratio; see page 115). Their main forms consist of geometrical figures of straight and curved lines in the most complicated combinations, from the lines of the Cufic (ancient Arab) writing and the so-called arabesques,* i.e. that purely linear foliage and scroll interlacings, that no longer recall nature prototypes. (Fig. 243). The acanthus leaf was transformed into an unnatural double and triple leaf, arranged in continuous wavy scrolls or extended in uniform geometrical arrangement over entire surfaces. The lines interpenetrate

interpenetrate and interlace, and in the panels formed by them is again added smaller and more graceful ornament, this likewise in patterns. All forms are strongly conventionalized, and round forms are represented as entirely flat. An animated coloring, in which the drawing and the ground are treated with equal values, gives to these ornaments their clear and harmonious tone and the peculiar oriental character. (Fig. 244). In certain provinces, chiefly in Persia, the motives are freer and are more naturally treated. Here also natural plants and figures are interwoven between golden arabesques and inscriptions. In their use the ornaments are graduated in relation to drawing and color with the most refined feeling, in order to produce the utmost effect possible, far and near. Derived from the recollections of the tents of nomads, these wall decorations produce the effect of stretched magnificently colored tapestries, with the treatment in flat relief like the perforated work or artistic lace hangings. In extravagant abundance are they extended over the entire internal architectural conceal the indeterminate architectural subdivision, and collect it in a wonderful play of form and color, that captivates the senses, and permits the structural ideas on the basal relation of support and burden to be entirely forgotten.

** The ornament thus designated was employed with especial favor by the Moors, and so was named Moorish from them. The Italian Renaissance took it up again and employed it chiefly for intarsias. (See Volume 2).*

In the ornamentation Mohammedan art attained its highest perfection; it designates likewise the tenor of all Mohammedan painting. By the aversion of the Arabs to represent living beings, painting could attain to no further development. For the same reason figure relief is almost entirely wanting. If exceptions occur, as for example in certain ornaments of the civic art of Egypt, or in the hall of justice and court of lions of the Alhambra, these are always to be referred to occasional foreign influences.

The most important monuments. -- In Arabia, Syria and Palestine, the countries first conquered by Islam, the earliest religious buildings exhibit partly very simple plans as prototyp-

prototypes of the later architecture of the mosques, partly a complete dependence on the existing models. The mosque at Mecca consists properly only of the sacred precinct surrounded by porticos with the Caaba in the middle, a small structure covered with black cloth, in the east side of which is built the black stone venerated by the Arabs; beside it is found a canopied pulpit, and in the vicinity is the sacred well. The Sakhra mosque, begun in 691 A. D., called Dome of the Rock at Jerusalem, is a Byzantine central building with a high domed octagonal domed interior 98.4 ft. diameter and two lower outer aisles, erected on the site of Solomon's temple. (Fig. 245). The famous mosque at Damascus (begun by caliph Walid in 705) rose on the site and utilized considerable portions of a Christian church. The model ground plan of a court surrounded by porticos and with liwan was at last attained by the great mosque at Medina, likewise built by caliph Walid in the beginning of the 8th century.

In Egypt the architectural works bear an expressed monumental tendency, that lends to them a surprising grandeur through the combination with the oriental love of magnificence. The mosques of Cairo belong to the most beautiful buildings of the world by their clear arrangement and subdivision of the mass and the splendid equipment. The mosque of Amrou was built in the year 643 by the use of antique structural materials as a court surrounded by porticos, but without dome and minaret. The same arrangement of ground plan, but with a minaret, is shown by the mosque of Ibn-Touloun (of the year 885), especially remarkable for the massive piers with columns in their angles for supporting the arches (Fig. 240 I) and the developed Arab architecture with the pointed arch. The minaret has an external stairway winding around it. But the most important and grandest plan is that of the mosque of Hassan, built in 1356-1359, at the same time a medresse (Fig. 252), with four liwans of great dimensions, in cross form about the uncovered court, measuring 105.0 x 117.1 ft., with a great domed tomb built at the eastern side and numerous rooms for the high school. Likewise the medresse of the Mameluke sultan Barkook, erected in the year 1386, is at the same time a mosque and tomb

with a similarly arranged plan. Of the later mosques, that of Sheik el Mouaiyah from the year 1416 again has the court plan with porticos, these having horseshoe arches with rich and splendid treatment. (Fig. 230). Among the tomb mosques the most important one is the mausoleum of Sultan Barkook (1382-1399), a regular and spacious court plan with surrounding monastery, living and housekeeping rooms, further the beautiful tomb mosque of Kaitbey (1456) with cross-shaped ground plan, at whose northeast angle and projecting into the street, (Fig. 236), lies the sepulchral chamber, covered by a stately dome. For the simpler mausoleums the numerous tombs of the caliphs at the east of Cairo present a necropolis of unique architectural magnificence. (Fig. 246).

In Sicily none of the larger monuments have remained to us from the flourishing period of Saracenic rule of more than 200 years (827-1060), besides the little palace of Menani near Palermo, probably falling in this period, and whose central room is represented in Fig. 233. But their art was taken into service by the Normans succeeding them, whose stanch buildings endured the storms of the time, and present us in their remains with extremely valuable documents for Mohammedan-Sicilian art, particularly for the plans of the palaces. In the Ziza, built about 1166, one of the Norman pleasure palaces near Palermo, we have the previously described (page 207) typical ground plan of the palace, as it was described by contemporary and later Writers. The entire equipment, particularly the use of the pointed arch throughout, indicates a dependence upon Egyptian-Arab art.

In north Africa on the soil of ancient Mauretania, Islam found a particularly favorable reception by the Moors settled there. Tunis and Algiers became paramount homes of Mohammedan civilization and art. The buildings (Figs. 247, 248) here bear in their general appearance the great tone of Egyptian art, but in detail that luxuriant wealth of graceful ornamental work, that amazes us on their architectural monuments erected in Spain on this side of the Mediterranean Sea.

In Spain was founded by the Moors in the year 711 a mighty kingdom, which remained in their possession for approximately

eight centuries (until 1492), and which by commercial relations with the Christian West attained to an elevated and flourishing civilization, evidence of which is given by the still magnificent and well preserved architectural monuments. The earliest work is the mosque of Cordova (Cordoba), founded in the year 786 as a rectangular court plan with the liwan at the southern side (toward Mecca). This was originally erected as a portico with eleven aisles, but was extended in depth in the 9 th century, and in width in the 10 th. The insufficient height of the Roman and Byzantine columns employed led to the doubling of columns and arches. The vast forest of columns shrouded in mystical semi-darkness, with the luxuriant arcade construction with horseshoe and foiled arches, which are partly interwoven (Fig. 241), produces an extremely solemn and fanciful impression.

Of the Alcazar at Seville, aside from the portions of the building erected by Moorish architects in the Christian period, (in the 14 th century), but few Moorish remains exist, and of the great mosque, there scarcely remains more than the minaret, the bell tower known to the world under the name of "Giralda". The most mature and magnificent monument of the Moorish style and in many respects also the chief work of the purely Mohammedan art is the Alhambra on the hills of Granada. It was originally (in the 9 th century) planned as a fortress, rebuilt in the 14 th century as a royal palace, but in the interior was only completed in the 15 th century, shortly before the collapse of the Moorish monarchy. The very irregularly arranged plan of the building is externally enclosed and without ornament like a fortress, and its porticos, halls and apartments are grouped around two rectangular and extremely harmonious arcaded courts, the court of myrtles, so named from the myrtles surrounding its water basins, and the court of lions, at whose flowing fountains 12 extremely conventionalized lions in black marble support the alabaster basin. (Fig. 249). At the north side of the myrtle court stands the massive Comares tower, which contains in its ground story one of the great magnificent rooms, the hall of the ambassadors. From the court of the lions the other four main halls are accessible, the vestibule-like hall of the mocarabes, the "hall of the sisters", the

gallery-like hall of justice, and the hall of the Abencerrages. Slender monolithic marble columns coupled in rich variety, horseshoe arches with very slight incurvature at bottom, stalactite and painted ornaments in inexhaustible richness and gleaming splendor of color characterize the internal treatment. As a unique artistic work of incomparable and magical beauty appear to us still those arcaded courts and interiors of the "red palace" of the last Moorish kings, dreamy and fabulous like their poetry and history.

In Persia but very few of the remaining monuments of Mohammedan architecture date from the earliest flourishing period under the rule of the Abbassides (750-1258). Their greater number belongs to the time from the 14th to the 17th century. The Persian buildings in general have a grand, earnest and monumental character, and both for mosques, as well as for medreses and mausoleums nearly the same ground plan. This represents a great court in form of a rectangle surrounded by arcades, extended by rectangular exedras at the middle of each side. Of the two exedras lying on the main axis, one leads to the principal portal, the other to the hall of prayer. Externally the plan is indicated by massive and strongly projecting middle buildings with great and deep portal niches covered by ogee arches, and smooth circular and very slender minarets at the main portal (Fig. 250), and at the entrance to the liwan, further by the network ornamentation in brickwork, the general use of the ogée arch, and the bulbous domes over the main interior, covered with blue enameled tiles.

22. A very regular plan of this kind is shown by the chief mosque of Veramin, erected 1322 (east of Teheran), likewise the great medresse of Bibi-Chanym at Samarcand (of the year 1399). The finest example thereof is afforded by the royal mosque of Shah Abbas the Great (1587-1629), erected with other splendid buildings on the Meidan (royal place) of Ispahan, the masterwork of the late Persian art. The two most important monuments in the provinces farther west, the mausoleum of Chodabende Chan in Sultanieh (1304-1316), and the magnificent Blue Mosque at Tabriz (erected 1478), unfortunately lying in ruins, again adhere to the Byzantine prototypes.

Mohammedan art extended to India in the 12th century, and indeed from Persia. It was therefore unavoidable, that the Persian plan and treatment of the interior should be directly adopted, and in the first time be clothed in the forms of the ancient Hindu architecture, in which at first only the ogee arch and the bulbous dome appear as novelties. This Pathan art, so-called from the Pathan dynasty (1206-1526), from the first has a tendency toward grandeur. Its most important works are:- the Kutub Minar at Delhi, i.e. the tall minaret of a mosque built about 1200 and now destroyed, further the Rani-Sipri mosque at Ahmedabad dating from the 15th century with graceful and purely Indian details, as well as the chief mosque at Mandu (15th century), kept in simpler and severer forms. A new and splendid period of Mohammedan-Indian art occurred under the great Moguls (1526-1707), that developed an almost boundless architectural activity. * Under them was first perfected an actual fusion of Persian-Mohammedan architectural forms with those of Indian architectural reliefs, so that an entirely new style arose, to which works of unheard magnificence and magnitude in wonderful perfection owe their origin. To what a rich development the architecture passed is evident from Fig. 251. (Treatment of window at Ajmir). Agra, the capital of the Great Moguls, and new Delhi were adorned by the most noble structures. The most prominent among these are; the Jumma mosque of new Delhi (built 1631-1637), an entirely regular plan, executed in white marble with inlays of red sandstone, and the grand chief mosque in Futtehpore Sikri, erected on a high terrace, from the second half of the 16th century with a similarly treated ground plan. By far the most splendid architectural work is the Taj Mahal (i.e. the world wonder) at Agra, the tomb erected by Shah Jehan (1628-1658), a combination of the Persian-Indian plan with the Byzantine dome construction, executed in marble of different colors with inlays of precious stones at immeasurable expense and unexcelled magnificence.

** Earlier writers speak of them in a characteristic way: "they composed like the devil and detailed like jewelers".*

These late Indian architectural monuments appear to us, not only as the ideal of the highest oriental art imagination become reality, but likewise as the most splendid representations

in the history of Mohammedan architecture. In the later buildings is already expressed decay and an invasion of European art.

The centre of gravity of Mohammedan civilization and power again lay in the West from the middle of the 15 th century.

In Asia Minor the Seldjuks had already developed a great architectural activity in the 13 th century, in which Persian and Byzantine influences cross and appear in combination with Hellenistic-Roman forms. For the mosques the courts are wanting, among them being the chief mosque (1220) and the mosque of Sahib Ata in Konia, the capital of the Seldjuks (the ancient Iconium). On the contrary these always exist at the medresses, so for the medresse of Ibrahim Bey in Akseria near Konia, further at the Sirtscheli medresse (school of jurists), completed in 1243, and the splendid Karatai medresse at Konia, built in 1251. In regard to magnitude and equipment, the most prominent monument of Seldjuk art is the caravanserai of Sultan-Han between Konia and Angora, erected in 1229 and measuring 389.5×198.8 ft.

Under the Osman Turks succeeding the Seldjuks already strongly appeared Byzantine influences on the soil of Asia Minor in the mosques of the chief cities of Broussa and Nicea, and after the conquest of the Byzantine kingdom, in the Balkan peninsula these became entirely dominant.

In Turkey the art of Islam chiefly appears as a revival and further development of the architectural ideas embodied in S. Sophia at Constantinople. This magnificent monument of Early-Christian-Byzantine church architecture was transformed into a mosque and then formed the ideal model for the numerous mosques of the capital (about 300 in Constantinople alone) and the entire Turkish empire. Except that an improvement frequently occurs, when the central impression is enhanced by attaching four half domes to the main dome. In the European provinces of Turkey, particularly in Syria and the neighboring provinces, becomes perceptible in the 16 th century the influence of mediaeval tradition and the art of vaulting of the Persians in the sense of a powerful treatment of the architectural details. (Fig. 253).

As the most prominent works of Turkish architecture must be

taken:- the mosque of Mahmoud II (1468-1469) erected by the Byzantine architect Christodulos, the mosque of Bajazet II (1603-1617) at Constantinople, and the two chief creations of Simon, the most famous Osman architect:- the noble mosque of Soliman II in Constantinople (completed 1555) and that of Selim II at Adrianople (1566-1574).

The extension of Mohammedan architecture remained limited to the countries, into which the Mohammedan religion found entrance. It frequently influenced western art, particularly the ornamentation, and not only influenced the Normans in Sicily, but also in Spain, Christian art after the expulsion of the Moors (in the year 1492), where it produced that interesting Mudejar style (Mudejars or Moriscos were termed the descendants of the Moors), in which Moorish techniques and Moorish ornamentation combined with Gothic and later with Renaissance motives into a new and charming architectural style. But otherwise the Mohammedan world of form always remained foreign in the West, as were the Sicilian Saracens and the Moors, and as the Turks still are today. It affords to us an extremely instructive example, how each isolated form of art shows a true reflection of the contemplation of the world forming its basis, and of the individuality of the history of its civilization and spirit.

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ARCHITECTURE
in its
Development from the Origin to the present Time
Introduction to its History, Technics and Styles

By
K. O. Hartmann

Volume II

Mediaeval and Renaissance

With 377 Illustrations

Leipzig

1911

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Urbana. Ill.

1912

PREFACE.

The scene of the art evolution considered in this volume is the West. In comparison to the first volume, which represents the progress of architecture among the peoples of antiquity and of Islam in its wide extent from the Atlantic Ocean to the extreme Asian East, the present one affords a far more unified picture. The close racial connection of the western peoples, the frequent concord in their intellectual life and in the impelling forces for art creations compelled a similarity in the bases, that made possible a more thorough treatment of the problem of the handling of interiors and the resulting construction and form treatment in the periods of the middle ages and of the Renaissance, so full of importance for the history of the civilization of mankind. The lively approval enjoyed by the principles laid down in the preface to the first volume and the manner of its execution, allows the hope to seem justifiable, that also the second volume, to whose printing the publisher has again devoted especial care, that it may find favorable acceptance in the circles for which the work is designed.

Stuttgart. February 1911.

Karl O. Hartmann.

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I. ROMANESQUE ARCHITECTURE.

I. General and historical basis.

Charlemagne left the Frankish empire founded by him at his death a well joined and immovable structure. But his successors were not strong enough to maintain it at its height. The unfortunate division of the empire, in which the empire was treated as the private property of the royal family, led to the greatest internal ruptures. To the third agreement of division at Verdun (843), which caused the separation, important in the history of the world, of the German speaking peoples from the Romans, there succeeded a period of miserable decadence, in which the Frankish lands were almost without protection and a prey to foreign enemies. In it commenced as a late offshoot of the migrations of the nations the powerful movements of the Normans (Vikings), the bold seamen of the high North, who from Scandinavia, their primitive Germanic home, visited the coast lands of Europe with ravage and robbery, then set foot firmly in France (Normandy) (912), conquered England later (1066), and finally even in the distant South founded a certainly short-lived but splendid kingdom in lower Italy and Sicily (1130). Thence scattered over the entire West, by internal dissensions and contests with external enemies, in the East with the Magyars among others, in the South with the Saracens, the German race now proceeded with undiminished strength. Their mightiest races, the Franks, Saxons and Swabians, adhered firmly together, and after the failure of the Carolingian heirs gave to the eastern Frankish kingdom a series of monarchs, under whom all German races were united and awoke to a national consciousness, such as was not the case under Charlemagne. With the founding of the "Holy Roman Empire" of the German Nation" by Otto I (in the year 962), a new period began for the West, that of the German middle ages.

Until then the western provinces of the Frankish empire had stood in the foreground of political and artistic activity. But now this role passed to the eastern Franks, to Germany, as the new empire was thenceforth named. The new state obtained its true basis by feudalism, that rested on the idea already developed in the Frankish empire, of a mutual and sacrificing

truth retained until death. An idealism produced this state system, and which never before nor afterwards had its like, and that in combination with the deep religious inspiration gave to the middle ages their peculiar stamp. Its most visible expression was found in knighthood and the ecclesiastical hierarchy. Then commenced a period of high importance to the history of the world and of civilization, which brought to the German empire its period of splendor under the Saxon, Frankish and Hohenstaufen emperors, to the German nations the climax of their power and their heroism.

This period also then found an expression in the architecture, which is to be counted with the highest works of the human intellect. There arose that national style of architecture of the North, later designated by the name of "Romanesque style", indeed because it came from the time in which the German intellectual life received its basal impulses from Roman civilization, and since it was directly connected to the Roman antique, fostered and revived by Charlemagne. But this appellation is so far insufficient, since even if many of its forms are prefigured in Roman art and that of the farthest Christian East, the Romanesque style did not have its native place in Roman countries, but where the German nation possessed superiority, in Normandy, Burgundy and Lombardy, and in its richest bloom in the entirely Germanic Germany. It would therefore be better termed the "Germanic style". For it is the German individuality, that appears in all its forms. The inclination peculiar to the German nations for the expression of racial peculiarities, for subdivision into regions and families, which in general were closed to the external world and permitted a comfortable separate life, the unusual dissensions manifested in even the smallest matters, that were only restrained by the all powerful idea of Christianity and the strong hierarchical conception of life in the period, -- these basal tendencies of the Germanic and chiefly of the German national character find a speaking reflection in the Romanesque style, and indeed in its separate solution not only by races but also by countries, in the expressed avoidance of all similar treatment of details, in the infinite variety of architectural and ornamental forms,

and finally in the combination of the masses by the ecclesiastical idea placed above all. Just therein, how the different members, often so diverse, exuberant in power and unrestrained, unite in a complete and harmonious whole, lies in great part that harmony peculiar to Romanesque architectural works, by which the German national life receives such a characteristic expression.

With the entrance of the middle ages the entire art life of the West assumed an unexpected upward course. To architecture fell the part of leader. It was developed on the structures for religious worship. The bishops' seats and the monasteries became not only the most important locations of Christian civilization, but also flourishing homes of the arts, whose fostering lay first in the hands of the clergy and chiefly in those of the monks, who already on account of the different needs of the separate orders had an interest therein, for working as executing artists with the help of lay brothers. In the measure in which the arts were also placed in the service of the nobility, and of the strongly flourishing cities for satisfying secular requirements, the lay element also took an increasing part in the mastery of the numerous architectural undertakings. Finally it was the imperial court, which proposed to architecture the grandest problems and brought them to completion at its command and with its means. Thus even the architecture of the Romanesque middle ages was connected with the splendor of the empire, with whose fate its flourishing and prosperity were most closely connected.

II. Evolution of Romanesque architecture.

The Romanesque style was not originated by a definite race of the German people or in a definite country; it was rather developed in various and far separated works approximately contemporary and in an entirely independent manner. The reaction of the Roman antique cannot be mistaken. It expresses itself first in the elevated conception of art taught by the Romans, in the mighty impulse, which that gave in regard to the employment of columnar architecture, in the technics of vaulting and in the entire treatment of the interior. To a Roman or

Roman-Early-Christian basal form also returned the principal building of Romanesque church architecture, the basilica. In its further development may be followed the entire course of Romanesque art.

The basis of the basilica was already prefigured in its most important parts in the Carolingian period (see Volume 1, page 179); the arrangement of the nave, transverse aisle and choir in form of a Latin cross, sometimes with the addition of a western choir, elevation of the choirs for the crypts, division of the nave into middle and side aisles, the installation of columns and piers to support the longitudinal walls and ceilings, inclusion of the towers in the building. (Fig. 1). The internal covering of the interior, excepting the apse, covered by a half dome, was always accomplished by the open framework of the roof, or by a horizontal wooden ceiling divided into panels or coffers. Likewise in the Romanesque period men adhered to this mode of covering, even if also in an ever more limited degree. (Fig. 2). (Fig. 3). But its small durability and easy destruction by fire led quite early to the endeavor to utilize for the basilicas the great advantages of vaulting methods, for which the Romans had left excellent models in their architectural works, which in many places still remained visible. Therefore men began in the course of the 11th century (aside from isolated attempts at vaulting in southern France, already falling in the 10th century, but remaining without further development) with the vaulting of smaller chapels and tomb churches, soon passing to the vaulting of the large churches, first in the side aisles and galleries, finally with advancing structural security, also in the middle aisles. Thereby was introduced an impulse into mediaeval architecture of high importance in the history of architecture. The construction of vaults powerfully affected the development of the plan, the treatment of piers and columns, the subdivision of the walls, and the handling of facades. The entire body of the structure was developed into an organism consistent in all its members and complete in itself.

Since the entire creation of the interior in ground plan and form was dependent on the mode of vaulting, to this was then

devoted the full attention of the architect. The simplest solution resulted from spanning the aisles by tunnel vaults with transverse arches as connecting the piers. It was chiefly common in southern France, where numerous Roman architectural monuments still exhibit this mode of construction. There are also found isolated domed churches and central buildings.

But of infinitely higher importance for western church architecture was the introduction of cross vaults. The Romans had already recognized their advantages for covering elongated rooms (see volume 1, page 105), and extensively employed them in their great designs for the baths. But the architects of the middle ages brought them to their highest perfection. In the first period men ventured only to construct round arched cross vaults, resulting from the intersection of two tunnel vaults of equal width and height. (See volume 1, Fig. 123). Thereby men were restricted to square bays in the arrangement of the ground plan, into which must be subdivided both the middle and transverse aisles, as well as the side aisles. To the latter was assigned half the width of the middle aisle, so that each two bays of the side aisles equaled one bay of the middle aisle. Thus originated the restricted Romanesque architectural system. (Fig. 4). Only after the architects had progressed so far in security of construction, that they could also proceed to cover rectangular rooms with tunnel vaults (Fig. 5) did the side aisles receive the same number of vaulting bays as the middle aisle, and the ground plan acquired a perfect harmony. (Fig. 6). But this advance also already indicates the climax of the development of Romanesque art, at least so far as its style purity is in question. For the technical acquisitions pressed toward freedom from the restricted system, toward the abandonment of the round arch and its restraining consequences. In the search for a form of arch, in which the rise is independent of the span, so that one could execute vaults over spans of different widths with equal heights, men in Picardy (north France) already in the first half of the 12th century hit on the fruitful idea of composing the vaulting line of two circular arcs. Thereby was the pointed arch (Fig. 5) introduced into mediaeval architecture. From its employment and the str-

structural and formal results originated a new structural system:- the Romanesque style passed into the Gothic.

The entire art activity of the Romanesque middle ages ended in a restless progressive evolution. Its beginnings go back to the middle of the 10 th century, indeed in a limited sense even to the days of the Carovingians. But in general for the Romanesque style in its formal development the year 1000 is to be regarded as the lower limit. A century later it also already attained its climax and after scarcely another century it also reached the last phase, that of the transition style. With regard to the course of evolution, three periods are therefore to be distinguished.

I. The early period from 1000 to 1100 (horizontally covered basilicas, beginning of vaulted construction, heavy and undeveloped forms).

II. The best period from 1100 to 1180 (horizontal ceilings replaced by vaulting, technically secure treatment of the latter, mature and elegant members and forms).

III. The late period (transition style) from 1180 to 1250. (Strong rise and free treatment of vaults, graceful and richest development of forms. Appearance of new elements, particularly of the pointed arch and of the buttress system).

For the limitation in dates of these periods the development of Romanesque art in the heart of Germany is chiefly considered. Other countries did not keep pace equally. In certain provinces of France the Romanesque period ended already with the end of the first quarter of the 13 th century. Also even in Germany at the same time the elements of construction and form of the Gothic style there developed gradually found entrance, here till the middle of the 13 th century the basal character of the architecture remained still Romanesque in its entire course. The transition style denotes for Germany the last climax of its national character in the splendid time of the Hohenstaufen emperors, freed from severe restraint.

A. Romanesque Church Architecture.

I. The ground plan.

The plan and treatment of the Romanesque churches is so varied, that scarcely a single one bears all the characteristic

marks. And still most buildings by the uniformity of their purpose have harmonious traits, from which indeed may be established a normal scheme. This is particularly true for Germany, where the "restricted system" was most clearly and consistently developed. The ground form of the church building is formed by the three aisled basilica. (Except in southern France, single aisled basilicas are only found in smaller city and country churches; five aisled are rare). In the ground plan all dimensions are arranged with a definite ratio to each other (Fig. 4). A mass giving unit is the square arising from the intersection of the middle and transverse aisles, the crossing. Adjoining it on the east is the choir square with the semicircular apse, on the south and north sides being a square as the transverse aisle, and toward the west several squares are prefixed (generally three to six in Germany), which form the middle aisle. The side aisles receive half the width of the middle aisle; they open at the east into the transepts, which as a rule are enlarged by two smaller side apses in the opposite wall as terminations of the side aisles. In richer plans, already in part in the best Romanesque period, but especially common in the late Romanesque period, the side aisles are also continued beyond the transepts as choir aisles. (Fig. 7). On French cathedrals a number of radially arranged chapels are often attached outside the choir aisle, which permit the erection of numerous altars and remarkably animate the eastern portion. (See volume 1, page 181). Double choirs and double transverse aisles still frequently occur in Germany in the early time of the ~~Renaissance~~ ^{Romanesque} period, (Fig. 8), but have an innate justification only for monastery churches, and they again gradually disappear in the late period. The inclusion of towers in the mass of the building is treated with increasing attention. Smaller churches receive one or two towers at the western end; for larger churches the number is increased to five or more, and in certain cases even to nine. Their grouping follows no definite rule. Most commonly four towers occur at the angles of the nave, two on the western facade and two in the angles between choir and transverse aisle; then they solve an important statical problem, since they chiefly op-

oppose the thrust of the vaults acting in the longitudinal direction. Yet they also frequently flank the apse or stand at the sides of the gable, sometimes also at the angles of the transepts. (See Figs. 17, 36, 45 and 9). Evidently determinative in the arrangement and treatment of the towers was the striving for picturesque effect and for a living expression of the heaven aspiring idea of Christianity. Over the intersection of transverse and middle aisles usually rises a polygonal crossing tower. (See Figs. 9, 36, 44). The crossing piers supporting it are consequently particularly strong. Not rarely also the crossing or the entire transverse aisle is taken into the raised choir (presbytery), and this is enclosed by low balustrades (concelli). In their places occur in the later time (analogous to the Byzantine iconostasis; see volume 1, page 188) high enclosures, that open by doors toward the middle aisle and are frequently treated as galleries. On these galleries, reached by winding stairs from the choir, was read the gospels, from which they received the name of "lectorium", the name of "lettner" (rood gallery) being derived from that. (See Fig. 162).

The importance of the crypt as a burial church beneath the raised choir goes back into the 12th century. By the influential and widely extended building schools founded by the Benedictine Order at Cluny in Burgundy and by the Hirsau congregation in Swabia, this was entirely opposed (on the other hand with it the continuation of the side aisles as choir aisles forms the rule). To the windows were given at first very small dimensions, in order to weaken the walls the least possible against the strong thrust of the vaults. They lie in the side walls of the nave, in the apse, and in the clearstory walls of the middle aisle. (See volume 1, page 151). For the same reason are the portals strikingly small. They were arranged, as on the Early Christian and Carolingian basilicas, in the western facade as separate entrances to the different aisles or between the two facade towers, or also and especially in churches with double choirs in the sides of the side aisles, the transepts, or in the southern or northern walls of the nave.

The large atrium of the Early Christian churches is omitted

almost without exception. The former portico (see volume 1, page 176) remains as a small open room inserted between the western towers or prefixed to the entire width of the facade, to which the name of "paradise" was given. The holy water basin placed within it at the entrance recalls a recollection of the former cantbarus. (See volume 1, page 149).

The location of the high altar, to which are added side altars in the smaller side apses, the cathedra and the seats for the priests, the division of the interior for the clergy and the people, follow the model given in the Early Christian basilica. (See volume 1, page 149). Since sufficient space was at the command of the clergy in the presbytery enlarged by the choir square and the crossing, and also sometimes by the entire transverse aisle, there could be an aisle taken from the former enclosure by balustrades in the nave.

Besides the longitudinal church system described here, there yet occur central plans among Romanesque church buildings. These are more common in southern countries (Italy and south France) than in the north, erected chiefly as baptismal chapels (baptisteries) beside the main churches, as churches of the Holy Sepulchre, or as chapels for the dead (so-called bone houses) in cemeteries. Parish churches based on the central scheme are more rarely found and then are explained by the particular conditions and relations of the countries and masters concerned.

2. The structure.

The development of the churches in height was carried on in the early time of the Romanesque period still entirely within the limits of the always low antique-Christian basilicas. Yet in its further progress the dimensions begin to increase, and in the best period of the restricted system (about in the second half of the 12th century), the height of the middle aisle to the springing of the vaults generally attained twice the breadth, thus being twice the side of the crossing square. But advances far beyond this measure were made finally. The structure itself is essentially determined by the mode of framing of the ceiling. So long as only visible framework of the roof or horizontal wooden ceilings came into consideration, t

there are also found more purely columnar basilicas, in which the walls of the middle aisle rest entirely on columns. But already in the Carolingian churches (Einhard's basilica at Steinbach; volume 1, page 181), the columns were replaced by the strong piers; these predominated during the entire Romanesque period. Yet also continued the alternation of piers (at the angles of the squares of the middle aisle) and columns set between them, which is first proved among the German churches indeed on the long since destroyed abbey church at Lorsch, dedicated in the year 774 (see volume 1, page 182), being especially frequent in the Saxon provinces. (See Fig. 8).

With the vaulting of the aisles another problem fell to the pier. It not only received the tolerably uniformly distributed weight of the wall, but became a supporter of the vault, and as such was dependent on it. The pier must then **first** correspond in strength to the load assigned to it, while if the great vaults of the middle aisle rested on it, it was to be made more massive, than if it only had to support the smaller vaults of the side aisle. But it must also be arranged in form according to its structural problem, when the members of the vault required corresponding support by rectangular projections on the pier or pilasters, extending from the impost to the base of the pier. Thus originated the main and intermediate piers, as well as the compound piers. (Figs. 10, 11). On them the statical function also came to be expressed decoratively. With advancing skill in vaulting they experienced an even richer treatment. The entire structure thus received by the internal alternating effect of supports and the forms of the ceiling an animated and rhythmic treatment. (Since the church architecture of the 12th century frequently undertook the vaulting of such basilicas, that originally had horizontal wooden ceilings or were intended therefor, the form treatment of the supports frequently omits a regard to the ceilings.

The earliest vaulting of Romanesque churches in the great style was carried on as entirely independent undertakings at the same time in three widely separated regions; for example in Burgundy at the abbey church of Cluny (1089-1095), in the Rhine provinces at the cathedrals of Speyer (between 1080 and

1100 and Mentz (begun 1081) and in Lombardy at S. Ambrogio in Milan and S. Michele of Pavia from the second half of the 11th century. All of them are based on a unified system, in so far as the elongated interior of the aisles is first spanned by several transverse arches, sometimes rising from the projections of the piers. These produced a subdivision of the ceiling into separate bays or areas, which were then vaulted. For the building first named, as for numerous French churches that assume a separate position in this respect, as we shall see later, the tunnel vault was chosen for the middle aisle. The others have the cross vault, infinitely more important for the evolution of mediaeval art. (See volume 1, page 105). This shows itself as particularly suited for church architecture, since the entire ceiling load is transferred to the lower ends of the groin lines, the transverse arches and their repetition on the walls, the side arches, and consequently entirely rest on the piers. At first the vaults were still unusually heavy and deep (in certain places up to 8.56 ft.), whereby is also explained the extraordinary thickness of the piers and abutment walls. The endeavors of the architect soon proceeded to reduce the weight of the vaults and particularly the strong side thrust resulting therefrom. On the original cross vault produced by the intersection of two tunnel vaults, the groin lines form a flat ellipse, since their intersection is at just the same height as the crown of the round arch. (See volume 1, page 123). This produces a much greater side thrust than a semicircular or stilted arch. To obtain a reduction of the thrust, men began gradually to raise the diagonal arches. About the middle of the 12th century, these reach the semicircle. On the separate tunnel compartments the line of the crown was no longer horizontal, but it rose toward the common vertex in the form of a flat arch. The vault compartments (these are the spherical triangles between groin lines and transverse or side arches) were swelled upwards, so that the swelled (bosom) vault was produced. (Fig. 12). In recognition of the high importance of the groin arches for a proper reduction of the vault, men finally decided (in Germany at about the end of the 12th century, in Norman France already in its second quarter),

to construct them like the transverse arches as projecting diagonal arches, combining them at the intersection in a boss. Thereby the bay was divided into a network of ribs, between which the compartments could be turned with unequal and less thickness. These ribbed cross vaults (Fig. 13) indicates an extremely important advance in the entire structural system. From its consistent use resulted most structural innovations of the transitional period and of all later mediaeval architecture. With the introduction of cross vaults first in the side aisles, then in the middle and transverse aisles, and with the execution of choir and cloister vaults (see volume 1, page 106) over the apses, and with the crossing was subsequently completed the creation of the interior of the cross vaulted basilica.

During the entire Romanesque period, the form of the pure basilica predominated with lower side aisles, raised middle aisle and windows in its clearstory walls. (Fig. 14). Yet other types of plan were developed with reference to the treatment of the interior or for structural reasons. The crypts were quite early covered by cross vaults and always had aisles of equal height. (See fig. 82). In the little chapel of S. B Bartholomäus at Paderborn (Westphalia) of the year 1017, the first example of the entire covering of an upper church by cross vaults in Germany, these in the same manner and manifestly under the influence of this crypt vaulting, are carried to equal heights over the middle and side aisles. Thereby was obtained indeed an interior supported by piers but of equal heights and consequently unified. Thus arose the system of hall churches. (See Fig. 15). A structurally favorable change was produced by the insertion of a vaulted intermediate floor in the high side aisles with the development of the upper stories thus formed into galleries. In these hall churches with galleries the intermediate floors produce a stiffening of the piers, and the transverse arches turned between the different divisions of the gallery with the leveling masonry above causes a side resistance to the middle main vaults. The impression of the interior approximates that of the basilica, but is inferior to that, since the upper walls of the middle aisle have

no direct light. To obtain a clearstory, men raised the walls of the middle aisle above the roofs of the galleries, and thus created a new type, that of the vaulted basilica with galleries. (Cathedral at Limburg-a-Lahn; see Fig. 16).

Differing from this general course of development of vaulted construction of the Romanesque period, that of the church buildings in France struck out a new path, especially in its southern provinces. It evidently commences with a direct imitation of Roman architectural methods with the spanning of a nave with single aisle, a so-called hall church, by a tunnel vault, that is subdivided into bays by transverse arches, which rise from wall piers like the antique or half columns. The nave ends at the altar and without the insertion of a transverse aisle, but with a square raised choir room, frequently covered by a dome, and an adjoining polygonal apse. But very early and after the end of the 10 th century was also developed the system of the hall church, that soon became at home in the Rhone valley as well as in the extreme south and west of France, and from thence penetrated into the north as well as beyond the Pyrenees into Spain. The insertion of galleries again gave a certain agreement of the interior created with the basilican type, which predominated in middle and northern France, both with and without galleries. Here the vaulting movement on the whole followed the normal course already described, while in a rather limited domain of the southwest, in Aquitaine and under Byzantine influences, the vault bays divided by transverse arches are covered by pendentive domes (see Fig. 58). The tunnel vaults maintained themselves elsewhere. On three aisled churches the tunnel vaults either lie parallel to the longitudinal direction or the side aisles have half tunnel vaults, whose crown line abuts against the walls of the middle aisle, thereby affording great advantages in construction, when they transfer the side thrust of the main vault to the external walls like flying buttresses. (Figs. 59, 61). This effect was obtained by placing the tunnel vaults transversely in the side aisles. These were soon succeeded by their intersection, and thereupon the adoption of cross vaults, first in the side aisle and finally also in the middle aisle.

With the increasing certainty of the mediaeval architect in

vaulted construction appeared a reduction of the wall masses corresponding to the lessened weight and side thrust of their vaults. Their intersections at doorways and windows became gradually longer. The latter generally continued narrow and small in the outer walls of the side aisles, but were enlarged in the clearstory walls of the middle aisle. The interior of the church was consequently filled with a mystical dim light, somewhat lighter upwards. The most favorable light was furnished by the windows in the polygonal drum of the crowning tower. Likewise the western and side towers received in the lower stories only small and slot-like openings, but still above the roof were made more light and graceful by the larger single and coupled windows. Particularly open was arranged the uppermost story, intended as a bell tower, in order to allow free passage to the sound of the bell. Conical or pyramidal spires, frequently massively constructed of cut stone, on which for square or polygonal plans, small gables usually rise above the different sides, forming the termination. (Fig. 17). For the external covering of the remainder of the building remained in use the gable, shed, hip and conical roofs, already common in the antique Early Christian period, with a covering of tiles, slates or metal (lead).

The technical methods exhibit in the beginning the still fumbling uncertainty of the builders in construction and form. These were even then chiefly of the clergy, who had no training in building. Only after taking into service suitable lay brothers for the erection of the buildings was developed a permanent race of mechanics, who indeed according to need traveled from one building site to another, was gradually crystallized technical knowledge. An arrangement of plan and preliminary calculations of the project for a church in the modern sense indeed never occurred. Frequently without regard to whether the means were adequate, the buildings were commenced, indeed as a rule with the most important part, the altar house. But not rarely must work be stopped and the buildings utilized; the enlargement and completion of the structure was a work of a much later time. From inaccuracies in the dimensions of the ground plan, for which the square still afforded a convenient

unit of measure, the variation from the right angle in the plan and the like permits the conclusion, that men also depended on very primitive tools and expedients. In the construction of the building the statical feeling, gradually attaining high development in regard to the treatment of piers and vaults, was often entirely wanting in a very important part, the substructure. The walls, so heavy in themselves and loaded by the masses of the vaults, usually had such insufficient foundations, and indeed set so flatly on the ground, that notable settlements already occurred during the construction, of which the "leaning towers" afford evidence today.

The material itself was mostly good. Men particularly understood how to prepare an adhesive and durable mortar. The marble in Italy produced a splendid effect and permitted the richest moulding and treatment in relief. In France indeed men had a less noble material at command, yet a fine-grained and easily wrought limestone; but in Germany on the contrary were chiefly colored sandstone and tufa, that in certain regions and especially on the Rhine permitted a finer chiseled work, but in other provinces the coarse-grained or porous structure precluded this. As the most excellent masonry was ranked ashlar construction, for the animation of which by bands and surface patterns of polychromatic stones appeared a special preference in Italy, as well as partially in the north. In using quarried stone, men chose a better material as a rule for the angles, mouldings, columns, piers and moulded members. In the bonding occur occasionally the opus reticulatum and opus spicatum, known from Roman remains of buildings. (Volume 1, Fig. 105). Very dangerous proved to be the widely extended use in the Romanesque period, of wooden timbers inserted in the external walls in order to distribute the pressure and for anchors, still to be seen in the west building of the church at Wimpfen-Tal, in the west choir of the cathedral at Worms, and on many other monuments. With other things it led to the collapse of the northern west tower of the foundation church at Fritzlar in the year 1363, and it was also manifestly one of the chief reasons for the fall of the tower of S. Marco in Venice.* Likewise the brick construction, already native in Lombardy

since the Roman period, in the 12 th century found entrance a and zealous use in the north German lowlands, where natural stone was only procured with difficulty. It there bears in the details numerous traits harmonizing with those of the brick-architecture of upper Italy. (The mediaeval wall bricks chiefly differ from the antique-Roman, in that the latter shows a deep red with a height of only 1.18 to 1.97 ins. and a length of 7.87 to 11.81 ins., while the mediaeval bricks have a lighter, yellowish-red color and are considerably higher, 3.54 to 4.72 ins. thick and about 9.84 ins. long). With the extension of stone and brick construction receded the importance of wood as a building material. Only in the high North, in Scandinavia and the adjacent countries, in which the churches were externally constructed of wood, it likewise continued in the middle ages.

** Vitruvius had already recommended for masonry inserted anchors of "charred" olive wood, i.e. charred over a clear fire, and which is infinitely more durable than oak or fir wood.*

3. Architectural treatment and decoration.

Like the entire structural system, so was also rooted the form expression of Romanesque art in the ground of the German-Roman antique, permeated by Byzantine and Syrian-Early-Christian tendencies. But during its growth it adopted in ever richer measure materials furnished by the northern German civilization, under whose influence arose changed and novel forms, which permit the primitive forms to be recognized in but general ways.

The internal architecture was substantially determined by the method of treating supports and ceilings, by the subdivision of the walls, and by the openings in doorways and windows. On columns and piers continued the classical divisions into base, shaft and capital. But otherwise they followed no binding law. According to the structural requirements, the columns are sometimes unusually thick and stumpy, sometimes thin and slender, especially the latter when they project from the piers as half columns. The base of the column retains the profile of the Attic base (Fig. 19), is at first unusually high, approximating classical proportions in the best period, but l

later becomes ever lower, appearing finally as a plate edged by a deep scotia, from which the torus lying on the plinth projects in a wide and flat form. A transformation of the base exclusively belonging to the Romanesque style was effected by the corner leaf, an addition at first like a block or knob, then ornamented in animal and plant forms of infinite variety, placed on the angles of the plinth (Fig. 20). -- It first appears in Lombardy, but already 50 years later is at home in Germany and there forms a characteristic of the art of the 12th century. With the beginning of the 13th century the angle ornament was supplanted by the annular moulding, projecting even to the angles of the plinth.

The column shaft is mostly monolithic (made of one stone) in Germany, in this case being somewhat diminished, but without entasis. It there remains in general more slender than in England and France, where as also in part in Italy, is preferred the construction in courses. The external surface is mostly smooth and seldom fluted, but usually in the later period is covered by zigzag patterns, strap, rope, scale and interlaced ornament. Occasionally occur knotted connections at the middle of the shafts of thin coupled columns. In Italy the columns are usually twisted in the most varied alternation and inlaid with costly mosaics. (Figs. 21, 69). The late period enriched the shafts further with the column band, an intermediate shaped moulded member inserted at its middle, first occurring on the small columns and giving them a good connection with the wall, also later passing to the free supports also as a characteristic mark of the transition style. (Fig. 40).

An infinite variety of novel forms was matured on Romanesque capitals. Originally imitated from antique forms in the Carolingian period (Fig. 22), they ever become more permeated and transformed by northern ornamentation, until the Roman form of the unknowable was approximated and was perceived to be neither clear nor beautiful. Therefore men passed to the selection of the simple square boss form for the head of the column, rounding this off on each side in a semicircle opening upwards, whereby a strongly supporting curved line extended between the abacus and astragal. Thus was obtained the cu

cushion capital, characterizing the best time of the Romanesque period. (Fig. 23 A). This permitted in a simple and esthetically tasteful manner the transition from the circular form of the shaft to the square of the impost of the arch, and it affords in the semicircles and the underside surfaces suitable for relief ornament, that developed an almost fabulous wealth of highly imaginative band and plant ornament, richly permeated by the mystical symbolism of grotesque human and animal figures. Even if still rare, the cushion capital was already found before 1050 on this side and beyond the Alps, earliest in Germany on the western choir of the Minster at Essen (volume 1, page 178) and in the church of S. Michael at Hildesheim (1001-1033; Fig. 41), but became naturalized in Germany from the middle of the 11 th century *, there dominating all architecture during the entire time of the best Romanesque period. As transformations of the basal form are to be regarded the four-parted cushion capital of the art of Alsace and of the lower Rhine, the octopartite in the region around Lake Constance, and the scalloped or folded capital characteristic of English architecture. (Fig. 79). In north German brick architecture is already found the trapezoidal capital already prefigured in Lombardy. (Fig. 23 B). In France the cushion capital never was actually naturalized; there the inserted frustum or a pyramed or cone predominated as the nucleus form of the capital. In Italy and in some regions of Germany the figure capitals enjoyed greater favor. (Fig. 24 A). The so-called "historical capitals" often present in their relief ornamentation an entire story in connected representation and distributed over an entire series of columns. With the beginning of the last quarter of the 12 th century, the use of the cushion capital diminishes; in the place of the heavy square block as a basal form occurs the slender bell. The capital with buds (Fig. 24 B) found entrance and soon became a characteristic mark of late Romanesque art. It was succeeded from about 1225 onward by the bell with leaves capital (Fig. 25) as the last stage of the forms of Romanesque capitals. -- The abacus added to the capital is mostly strikingly high, treated with strongly supporting mouldings, and it is decorated by relief orname-

ornament in the richer development.

* *About the same time (1050) "disappear in Germany the reminiscences like the antique."* (Dehio). Further see page 24.

The piers chiefly follow the columns in the forms of their bases, are made in courses, are circular in Norman England and also partly in France and Italy, but in Germany are of square section, originally simple and plain, later with chamfered or coved angles and also frequently with the addition of graceful and slender little columns in the corners. As upper termination they receive a square abacus, chamfered below or moulded with torus, ogee or cove, more rarely ornamented or having its own sculptured capital similar to that of the column. With the development of vaulted construction the pier also received an increasingly richer treatment, while from it projected or were inserted in the angles, rectangular pilasters, half or three-quarter columns, corresponding to the transverse arches and ribs of the vault. (Fig. 11).

Besides columns and piers, Romanesque art also employed corbels as supports, i.e., consoles, that project from the walls and receive the imposts of the vault ribs, if the wall or member of the pier were not prepared for them. (Fig. 26). At first made simple, only reduced below or returned in torus, cove or ogee members; they later also diminish in width downward, and finally have the form of pyramids, deeply moulded or covered by ornamental work.

To the arches rising from the columns and piers is generally lacking the moulded archivolt common in the antique. Likewise the internal walls have no further subdivision; this was not necessary, since the walls were generally covered by a series of pictures. Narrow and slightly projecting belts, at first merely a slab with beveled lower corner, later formed with a flat cove and mouldings, extend above the arcade arches, below the rows of galleries and windows, sometimes also at the height of the uppermost capital, but frequently are entirely omitted. Where recollections of the antique have a stronger influence, or where a more animated effect in relief was intended, the bands were more strongly accented and more richly developed. In this Romanesque the frieze decorations present unusual

variety. Most commonly are found the round arched friezes (see volume 1, pages 143, 157), both in their simplest form, only composed of voussoirs, as well as also with consoles, enclosing mouldings and ornamental work. The arches are sometimes interlaced. The round arched frieze is indeed but seldom employed in the interior (Fig. 63), but so much the more frequently on facades.

Other and frequently recurring forms of friezes are:-- the Romanesque dentils (with dentils set diagonally), the billet moulding, the zigzag, roll, scale, chessboard, lozenge, rope and sphere friezes. (Fig. 27). To these are also added the ornamental frieze developed from plant and animal motives (Fig. 34), which are either entirely freed from a geometrical basis or only subordinated thereto in their main lines.

A very expressive treatment of the walls is effected by the narrow columnar galleries or passages inserted in the thickness of the wall, and gradually occurring instead of galleries, the so-called triforiums (see Fig. 109). If horizontal wooden ceilings still occur, they are no longer divided in panels or coffered, as in the Early Christian basilica, but are sheathed smooth and painted.

The vaults first receive an architectural treatment with the addition of the vault ribs. The gradual transition of the ribs from the rectangular cross section to the compound profile, in which the round always dominates and to the pointed round of the transition style is apparent from Fig. 28. An example of the keystones with very varied forms and ornamentation is given by Fig. 29.

In Germany the windows lie in the middle of the wall, but in Italy, Spain, England and a great part of France are at its outer surface. In order to ensure the most favorable admission of light through a relatively small opening, the jambs (the wall surfaces enclosing the door or window opening) are strongly splayed, in Germany both externally and internally, elsewhere only internally. For the closure was glass now generally employed instead of the earlier curtain or wooden shutter, and this quite early reached an artistic use by its composition in different colors and patterns with the leading and the true g

glass painting. (See page 98). In the early and best periods the window openings are almost always covered by a round arch. They are frequently coupled, especially on the towers, i.e. divided into two, three or more openings by the insertion of dwarf columns. Above the little columns then lies an impost extending through the entire thickness of the wall. With a more elegant construction (Fig. 30), the window jambs are subdivided, either recessed externally in steps with the addition of small columns in the angles thus formed, or even furnished with an enclosing member, in which the rounds predominate. The late period introduced new forms of arches, among the impulses coming from the East by means of the crusades, among which occasionally occur even the horseshoe and foiled arches. A permanent element of mediaeval art became the trefoil arch, and especially the pointed arch, the latter gradually almost entirely supplanting the round arch. A new idea was also formed by the rose or wheel window as a great circular opening in the wall, subdivided by inserted columns like spokes or by bars, and which was preferably arranged in the gables or over the entrances. (Fig. 31).

Great attention was devoted to the construction of entrance doorways, especially those of the main portals. In the early and best periods they are likewise spanned by round arches, later in part by pointed and trefoil arches, but they generally have a straight lintel over the actual doorway, in order to obtain a semicircular tympanum for the addition of relief ornament. (Fig. 48). The unusual thickness of the walls already required, so that the House of God might be quickly emptied, a funnel-shaped splaying of the jambs. With the most common mode of treatment, these are subdivided in several rectangular steps; in the resulting angles were then set columns or rounds with simple or richer and varied treatment. (Fig. 32). Thus sometimes square-edged piers alternate with round columns on the jambs of the portals, and that are also continued in the arches, enclosing the tympanum like a frame. The late period yet enhanced the magnificence of the portal by the addition of statues, which were then preferably placed in the angles of the square piers, hollowed out for them and on small pedestal columns. (Figs. 48, 75).

The external architecture in its general appearance permits the ground plan of the church structure to be clearly recognized; we see the nave with the middle aisle above the side aisles, the crossing of nave and transepts, the choir or choirs with the apses and the massive towers, that animate the entire organism and strengthen it in a sense. The external structure commences with a plinth, whose upper member is profiled like the Attic base, as a rule. It extends around the entire building. Above it rise projecting narrow wall strips, by which the external wall surfaces are divided into bays, in the middle of which lie the windows. (Figs. 9, 36, 44, 45). Instead of the wall strips are also frequently employed slender half columns (Fig. 18) or pilasters with bases and capitals. In the later period the wall strips project further from the face and thus increase the thickness of the wall, then corresponding to the internal supports. Finally they pass into the buttress reduced upward by several offsets. Below the roof cornice, the belts and inclined gables, the wall strips are connected with the round arched frieze, so particularly characteristic of Romanesque architecture. (Fig. 33). The apses frequently have a preferred treatment by blind arcades. Horizontal subdivisions of the external walls by belt courses are usual in Italy, France and England, but in Germany are scarcely found except on towers, where they serve for the division into stories, and as a rule are furnished with the Romanesque dentil band and other decorative forms. The exterior of a great cathedral receives the most splendid architectural decoration by the triforium extending below the base of the roof as a dwarf gallery; these are particularly favored along the Rhine, and are wonderfully beautiful on the cathedrals of Spire, Worms, and on the churches of Cologne. (See Figs. 17, 36). A main cornice, of form similar to the belt cornice but more strongly accented, and having round arches and other frieze decorations above each other and often greatly varied, forms the upper termination of the external wall surfaces. Besides the ornamental forms mentioned on page 20, Romanesque ornament (Fig. 34) yet takes an important part in the decorative treatment of the architecture. Derived from antique tradition, th-

that was not transmitted in its original purity, influenced by Byzantine and Syrian-Early-Christian conceptions, and dominated by the expressed desire to please in the most varied changes, it soon passed into a peculiar development. As basal elements are to be designated geometrical patterns and interwoven bands in often irregular combination, plant motives, animal and human figures. Since skill in stonecutting was frequently lacking to the stonemasons, the acanthus forms pass into dry and ragged shapes and almost entirely disappear at about the middle of the 11th century. (Indeed these still appear in the 12th century on a series of monuments, for example also on the portals of the cathedral at Spire originating about 1180, charming acanthus leaves in Grecian treatment, which indeed indicate a direct connection of their designer with the East by the relations resulting from the crusades. (See volume 1, page 198). Plant motives employed in Romanesque ornament are not conceived naturally, so that one might recognize a particular kind of plant, but they are treated purely conventionally and are strongly conventionalized. They are mostly leaves with three, four or five divisions with strongly expressed ribs and lancet or rounded lobes and margins, added to the bands and scrolls and subordinate to these. Generally certain bands, leaf ribs and edges are beset by rows of beads or lozenges, that recall the nail heads of armor. Animal and human figures, fabulous beings and symbolical forms of all kinds pass over directly into the foliage, scrolls and bands, representing Biblical or historical materials, but are frequently only an expression of an animated, very grotesque imagination, saturated with the gloomy and demonic representations of the northern series of sagas. (See volume 1. Animal ornamentation). The technical execution of the ornaments adheres in the earlier time to the flat incised handling of Lombard ornamentation (see volume 1), but later passes into representation in relief, with skilful figures in sharp cutting, wrought almost free, and an intense alternation of light and shade. The powerful treatment, the precious freshness and naturalness, and the inexhaustible variety of forms, in which the formative power of the imagination cannot do enough, lend a very particular worth to Romanesque decorative art, even in comparison with the clear

and finely executed ornamental work of the antique.

Monumental sculpture begins in the first half of the Romanesque period with tasteless attempts (bronze doors on the cathedral at Hildesheim, completed in 1055), but it passed through a mighty upward course in the splendid time of the Hohenstaufens, which may be recognized in the rich ornamentation of altars, rood screens, pulpits and portals with statues and sculptures in relief. (See Figs. 48, 75). With all their awkwardness, the figures exhibit the method of a fresh and natural sense, combined with a feeling for style trained by the architecture. In the physical proportions are they still quite defective, in post or movement being still stiff; but they have in their faces a strong and solemnly earnest expression, which evidences a noble and deeply religious conception.

— A great problem falls to painting in the Romanesque period.* Over the entire interior of the Romanesque church extended an animated polychrome treatment, by which the architectural members were emphasized, and the wall surfaces and ceilings received a tapestry-like and brightly colored covering. (Fig. 35). In bold and usually black outlines are drawn the ornaments forming the frieze and panels, and the separate surfaces thus enclosed are filled with simple colors without any indications of shades. Likewise in the pictured representations of scenes from the Bible or the life of the patron saint, the figures have no modeling in relief. They are executed in the same manner as the ornaments, conventionalized with refined rhythmic feeling, and they are arranged modestly in the enclosures afforded by the architecture. The deep repose, that rests upon these representations, the warm tones of color poured out over the interiors enhances and perfects the earnest and reverent harmony and surrounds the Christians entering for a contemplative assembly and quiet devotion. Likewise the exterior of the Romanesque church combines in a harmoniously united and rounded entirety. The Rhythmically arranged and graduated masses of the building, which permit a clear recognition of the purpose of the enclosed rooms, presents by its picturesque grouping and highly monumental treatment extremely impressive effects of solemn dignity and augustness. (Figs. 9, 17, 36, 45).

* *On the evolution of glass painting, see Chapter 2 of this volume, page 98.*

In the general view of the Romanesque architecture of Germany the late time, the period of the transition style, occupies a distinct place. During its entire course is expressed a lively change in the construction and in the architectural forms, a joy in handling and an imagination, such as seldom manifested in the history of architecture. Such times always appear especially accessible to innovations and to foreign influences. Therefore the architectural style developed meanwhile in France, by which the Gothic style was founded, soon found entrance into German lands. Considered in connection, the transition style is characterized by the following chief phases.

Men took over the pointed arch as a vaulting line as well as a new element of decoration, the vault ribs, the polygonal choir ending, that was more suitable for the treatment of the vaults over the choir, than the round apse. Likewise in the arrangement of the ground plan did men gradually become freed from the system restricted to squares, made the middle aisle widen and let the bays continue, so that the middle and side aisles received the same number of vaulting bays. With regard to the ribs were arranged more richly subdivided piers, the doorways and windows were enlarged, and the walls were relieved by increasing the wall strips to stepped buttresses. (Fig. 23). But the round arch still continued in use, though it was supplanted by the pointed arch, especially in the arcades of the middle aisle, and also partly by the trefoil arch. (See the door closure composed of two quadrants and a semicircle in the round arched tympanum of Fig. 32). The latter found a favorite place over doors and windows, and is especially common in blind arcades and triforiums, which enjoy great favor as an effective means for animating the external and internal surfaces of the walls. Also other forms participate in the general movement. The columns become more slender and are usually coupled, i.e. have a common abacus. On the low and deeply coved base the corner leaf disappears, since the lower wide torus projects beyond the angles of the plinth. The shafts receive at the middle the column ring. The heavy cushion capital is

gradually replaced by the lighter and more elegant bell and bud capitals. The heretofore simple and smooth archivolts of the arcades and windows are enclosed by round and cove. The cornices become weaker, more lightly profiled and formed with deeper coves. Finally the profile of the round in the diagonal ribs of the cross vault begins to approach the pointed round. (Fig. 28). With the strong raising of the vaults, the openings in the walls become larger and the buttresses thicker. The roofs ever become more steep; the tower spires higher and more slender. And thus is completed quite gradually and almost unnoticed the perfected transition to the Gothic.

4. Peculiarities of Monastery Churches.

Likewise to western monastic architecture did the era of Romanesque architecture bring the classical age and a term of extraordinary fruitfulness. There were chiefly three ecclesiastical societies, that powerfully influenced the evolution of mediaeval monastic life and architecture: the monastery at Cluny in Burgundy produced by the Benedictine Order (Volume 1, page 182) in the 10 th century, and its daughter establishment, the monastery at Hirsau in Swabia, and the influential monastic Order of Cistercians, likewise a branch of the Cluniacs at about the end of the 11 th century, whose original monastery lies at Cîteaux. (Western France). While the Cluniacs and with the Hirsau monks set as an aim an improvement in ecclesiastical conditions by a reform in monastic life, by an elevation in the customs of the clergy, and the utmost separation of the clergy from secular interests, the Cistercians saw in the return to ~~the severe~~ rules of the Order of S. Benedict their life problem, and indeed they took up ~~these~~ in their most original form, devoted to agricultural activity. Unoccupied and marshy, even unhealthy lands covered by standing water (Cisterciaux, cisterns) should be transformed into fertile soil, but the copying of books, painting of miniatures etc., should be dropped. It was infallible, that the principles of the different Orders should be transferred to the architectural style and lead to a definite regulation, which should then by their great extension, the Cluniacs chiefly in France, the Hirsau monks in Germany, and the Cistercians in almost all civilized

lands of the time, won a mighty influence over the entire evolution and spread of mediaeval art.

The building programme already described for monastic designs in volume 1, page 183, the nave church and the arrangement of the separate structures was also substantially retained in the result. An exception from this was made by the Templars, for whom the Dome of the Rock erected at Jerusalem on the site of Solomon's temple (volume 1, page 216) served as a prototype, and who therefore arranged their churches as central buildings with a columnar aisle, and the Carthusians, who prescribed to the monks the hermit's life and thus favored the system of cells.

The architecture of the monastic churches exhibits special peculiarities for the different congregations.

The Cluniacs had for their earlier and more severe architectural type the model in the abbey church of Cluny, dedicated in 981, a horizontally covered, three aisled columnar basilica with eastern transverse aisle, rectangular choir ending, two rectangular chapels as side choirs, and two massive western towers above a vestibule. This scheme of plan was adopted by the German daughter monastery at Hirsau as a model for the churches erected by it and its congregations. The later Burgundian school in the climax of the Cluniac Order abandoned their former principles of simplicity in design and equipment instead of the previously erected churches of the Order. The building constructed in 1089-1095 and 1131 (Fig. 38) contained five aisles, two transverse aisles and five radially arranged chapels. Further the transepts were each enlarged by two apses on the eastern side. About 1220 the building was yet extended by a three aisled pro-church belonging to the transition style. Thereby was attained the length of the old church of S. Peter in Rome. For the internal equipment were employed costly materials, in part even Pentelican marble. The exterior received a grand treatment by the animated subdivision of the architectural masses and the seven towers (over the crossing, the intersection of the inner side aisle with the larger transverse aisle, at the western angles of the transverse aisle, and on the western facade. The Cluniacs in their later buildings followed the model afforded by the principal church of t

the Order, even with a corresponding simplification in plan and execution. Their model churches are always three aisled with single aisled choir, eastern transverse aisle and a vestibule. They carefully avoid the crypt, have a second choir with aisle and radially arranged chapels (as at S. Martin's church in Tours; volume 1, page 181), tunnel vaults with cross arches in the middle aisle and cross vaults in the side aisles. Instead of galleries, triforiums extend below the windows of the clearstory. In the construction and the arcades of the nave prevail the pointed arch (it is already found in the arcades of the principal church at Cluny just mentioned), but the round arch remains in the windows and decorations. A peculiarity in form is shown by the Cluniac churches in architecture by the classicistic treatment of the fluted Corinthian pilasters as projections from the piers, from which comes the compound pier in steps.

The chief activity of the Hirsau monks falls in the time between 1080 and 1150. Their churches are three aisled columnar basilicas with vestibule, over which a gallery opens to the interior, eastern transverse aisle and rectangular enclosed choir with two rectangular side chapels as side choirs. Two massive western choirs flank the vestibule. Occasionally instead of them is erected a crowning tower, to which are added two eastern towers. The middle aisle is covered horizontally; the side aisles have simple cross vaults. An earnest and dignified equipment is peculiar to the monastery churches of the Hirsau monks. They restrict themselves exclusively to the round arch, employ only cushion capitals, even at first form the bases of the columns without corner leaves, and also generally omit the wall strips and arched frieze. To the Hirsau monks is it due, that the basilican scheme was again restored to its primitive form, after its general effect had been much influenced by additions and extensions of many kinds. The mother churches of the Cluniacs and Hirsauers have disappeared with few remains. In the abbey church at Vezelay in Burgundy is still presented a complete representation of its severe style.

Yet greater than of these two Orders was the part of the Cistercians, whose congregation was founded in the year 1085 at Citeaux (Cistercium) in northern Burgundy, in the history of

mediaeval architecture. Their zealous, self-denying and useful activity in the domain of agricultural colonization soon assured to them great popularity and extension, so that they finally attained to a spiritual power, to which the importance of all others gave way. Likewise for their church architecture, they established a limitation to the necessary and the useful as the supreme rule. The towers could be dispensed with; only a wooden roof ~~turret~~ over the crossing to receive the small bell was declared justifiable. The crypt was everywhere omitted. As a normal ground plan remained the cross-shaped basilica with relatively narrow and elongated nave, a single transverse aisle, whose transepts were extended by small chapels at the eastern side (see ground plan b c d in Fig. 186) and a rectangular enclosed choir. The number of chapels was increased toward the end of the 12th century. They are arranged as small rectangular cells around the entire choir and the eastern side of the transverse aisle, sometimes as a double aisle (Fig. 39), each of them covered by a common shed roof extending around. The German Cistercian monasteries at first still preferred the horizontal ceiling, but soon passed to vaulting, whose improvement by the introduction of the pointed arch, they utilized earliest in Germany. (The Cistercian at Bronnbach near Wertheim-a-M, founded in 1151, is the first German building with pointed vaults and an entire retaining of Romanesque forms). The interior remained almost without decoration, without galleries and triforium, without paintings on the walls and without color in the windows. For the capitals was preferred the bell form, either plain or sparingly decorated by foliage. The corbel-like supports of the large rounds (Fig. 40), (indeed for reasons of economy), is an architectural peculiarity of the Cistercian churches. The clear, assured and direct technics held equal pace with structural acquisitions developed in France, in regard to the arrangement of bays of equal length, the construction of supporting arches etc. Thus the Cistercian art in the wide regions of its extension prepared the ground for the Gothic, in whose stream the individual character of its style vanished after the middle of the 13th century. Of the numerous well preserved Cistercian abbeys,

the monastery at Maulbronn in Wurtemberg furnishes the most famous example, in regard to the equipment, indeed frequently exceeding the original severity and modesty of the rules of the Order.

5. Extension in the different countries and the monuments.

I. Germany, Austria and Switzerland.

German architecture produced in the Romanesque period, the best and most splendid ~~age~~ of the German nation, such an astonishing abundance of monuments, that we must restrict ourselves to mention only the most important. Likewise we have before us but few of these in their original condition. Most are so changed by rebuilding, that only certain architectural parts date back to the time of their origin. In the general view of the Romanesque art of Germany belong the most prominent creations of three great architectural domains:-- the Rhine provinces, the Saxon lands and Westphalia. Everywhere are reflected the racial peculiarities of the occupants in the conception and execution of the buildings.

The Saxon provinces at first took the lead, just as in political affairs, so likewise in art. In their works is expressed a desire to adhere firmly to Carolingian traditions and for strict order in ground plan and structure. Most common is the normal type of the cross-shaped basilica with round choir, side apses in the cross aisle, alternation of supports in the nave and two massive western towers. To the basilicas with horizontal ceiling, double choirs, double transverse aisles and an alternation of two columns with one pier belong the grand and epoch-making church of S. Michael at Hildesheim (Figs. 8, 41), built in 1001-1033, later rebuilt after the old plan and dedicated in 1186, the cathedral (1122-1190), and the well preserved and richly decorated church of S. Godehard in Hildesheim (1132-1172). (Fig. 42). In simple cross form is arranged the castle or foundation church in Quedlinburg (1070-1129). Of the smaller monuments with simple alternation of pier and column are to be mentioned the church at Gernrode, founded in the year 960, and the monastery church at Hecklingen (1117-1170), the latter as the pattern plan of the normal Saxon basilica. (Figs. 1, 2). Pure columnar basilicas are employed only by t

the monastery church at Paulinzelle, (founded 1105), yet remaining in picturesque ruins, and the canons' foundation at Haersleben (founded 1112). Pure pier basilicas are the cathedral at Bremen (about 1050), the Liebfrauen church at Halberstadt (begun 1135), and the beautiful foundation church at Königsliutter (begun 1135), of which the choir and transverse aisle are already covered by cross vaults (without ribs). Aside from the cathedral at Brunswick (1173-1194), a vaulted pier basilica with restricted ground plan and still purely Romanesque forms, a complete vaulting was first received by the buildings of the transition style, which indeed retained the restricted system of ground plan, and likewise the round arch in the portals and windows, but otherwise introduced the pointed arch and the decorative innovations:-- the cathedral at Naumburg with double choir (middle building dedicated 1242), the cathedral at Halberstadt (1181-1220), the Liebfrauen church at Arnstadt, the cathedral at Magdeburg (begun 1209), whose structure already appears entirely Gothic, and the cathedral at Freiberg-i-S, but of which only the famous "golden portal" with the masterly and formerly gilded statues was saved in the Gothic rebuilding. Among the Cistercian churches erected in the ancient Saxon soil is most interesting that of Fiddagshausen near Brunswick, dedicated in 1278 (Fig. 39). The outer aisle of the choir is covered by a low, and the second by a high shed roof, so that the choir end shows three roofs like terraces rising above each other.

In Westphalia the buildings take a course directed toward the simple and practical, that first of all regards the fulfilment of the nearest needs, with solid construction and without placing great value on ornamental accessories. The churches are mostly pier structures in hall form (with aisles of equal height, page 12), with cross vaults, that occur very early in the already mentioned chapel of S. Bartholomaeus at Paderborn. (Page 6M). The cathedrals at Paderborn and Minden are cross-shaped hall churches, the former with rectangular enclosed choir, the latter with a Gothic choir. The imposing cathedral at Soest was originally a pier basilica with a horizontal ceiling, but still received its vaults in the Romanesque period.

Among the Westphalian buildings of the transition style stand in the first place the cathedral at Osnabrück (1256-1291), a vaulted pier basilica with octagonal crossing structure, the cathedral at Münster (1225-1261), likewise a pier basilica in the restricted system with double choir, the magnificent church of S. Reinold in Dortmund (cross-shaped basilica), and among the Cistercian designs the severe monastery church at Marienfeld (1222).

The Rhine provinces, in which blessed region the Romans once developed their art and civilization, on whose soil only originated flourishing and populous cities, likewise brought Romanesque architecture to its most splendid development. Here in a people particularly favored by nature were combined an elevated spirit of a religious tendency with a civic sense of enjoying life, that pressed towards artistic activity and embodied its grand architectural ideas in works of highly monumental form and the richest equipment. From the early period date the abbey church at Limburg-a-H (about 1034) and the foundation church at Hersfeld in Hesse (about 1040), both horizontally covered and spacious columnar basilicas, today remaining only in ruins. The best period was introduced by the chief works of Romanesque art, the great cathedrals of Speires, Mentz and Worms. They are entirely vaulted in accordance with the restricted system of the Romanesque, but were erected as horizontally covered basilicas in their first design. The cathedral of Speires precedes in time, at least in its existing form. It was erected by the emperor Heinrich IV in place of an earlier structure (built between 1030 and 1060) between 1080 and 1100 as a cross-shaped basilica with western vestibule, an unusually large nave with seven bays in the middle aisle (Figs. 4, 43), a roomy crypt as a burial place for the Salic imperial house, two domical towers (over the crossing and the vestibule), and four slender square towers in the eastern angles of the transverse aisle (Fig. 17) with the vestibule and nave. The clarity and beauty of the proportions of its masses and the grand and spacious effect of the interior is attained by neither one of the other two cathedrals. The cross vaults were still executed without ribs on the cathedral of Speires. The rib-

ribbed vaults in the cathedral of Mentz were first added at a later time, which may be determined from the form of the piers not intended therefor. It is highly probable that this was also the case on the cathedral at Worms. The cathedral at Mentz was erected from 1081-1137 in place of an earlier structure, already existing from 778 to 1050, as a cross-shaped basilica with a shorter nave (five bays), western choir and small crypt, two massive domical towers and four smaller polygonal flanking towers. (Fig. 44). Likewise the cathedral of Worms had a precursor in a building erected from 1000-1025, but was constructed in its present form from 1171-1234. It is also arranged as a cross-shaped basilica with doubled choir, the nave with five bays, without a crypt, but having two polygonal and four round flanking towers. Its external appearance has an extremely grand and picturesque effect.

With the most prominent Romanesque buildings of the Rhine provinces is also reckoned the Benedictine abbey church at Lach near Andernach, a cross-shaped pier basilica with western choir (1093-1156), before which is placed a "paradise" as an enclosed uncovered portico, and with six towers, in plan and structure a bold and noble work (Figs. 6, 45). The picturesque minster at Bonn also has a doubled choir. The beautiful parish churches at Andernach and Sinzig exhibit galleries over the side aisles, have round arcade arches between pointed cross arches.

The church of S. Castor in Coblenz (1157-1201), a pier basilica with four towers, is vaulted in the restricted system. The parish church at Boppard (about 1200) has in its middle aisle a pointed tunnel vault subdivided by cross arches. Opposite Bonn and on the other bank of the Rhine stands the beautiful church of Schwarzerheindorf (1149-1151), that affords an example of the generally common type of the castle and fortress chapel, while it exhibits two stories on the same ground area, that ^{are} connected by an opening in the ceiling. The upper story was intended for the nobles, the lower being for the servants or even a tomb chapel. In Cologne, the ancient Roman city, several important churches originated with peculiar and the richest treatment of the choir and transepts. At S. Maria

im-Capitol (dedicated 1049), the church of the Apostles (second half of the 12th century) and Great S. Martin (dedicated 1172), the choir plan approximates to the central system, while the arms of the cross also terminate in apses (as at the church of the Nativity in Bethlehem; see volume 1, page 162) and the side aisle extends around as the choir aisle (Fig. 46). S. Gereon appears entirely as a decagonal central building, that was extended in 1089 by an elongated choir ending in semicircular form. The church has a splendid and spacious crypt. Likewise at the church of S. Quirin at Neuss, built after 1207, is repeated in the eastern portion the triapsal ground plan of the first mentioned churches at Cologne. Its windows exhibit peculiar forms, the fan, trefoil, and the like (Fig. 47). It is the principal work of the transition style of the lower Rhine, which was particularly accessible to such innovations. As the chief buildings of the transition style of the middle Rhine and of Hesse are to be mentioned the great cathedral at Limburg-a-L. (1213-1342; Figs. 9, 16, 37), a cross-shaped basilica with round choir ending and inner choir aisle, in which the galleries and triforiums have pointed arches and are continued above the side aisles, together with the magnificent parish church at Gelnhausen, equipped with the richest ornamental work.

In the region of the upper Rhine, the minster at Basle, erected in 1185, a vaulted basilica arranged in cross form on the restricted system with five aisles, a choir aisle and two western towers, is reckoned with the best creations of the transition style. Likewise the two principal works of the Gothic period, the minsters at Freiberg-i-B. and at Strasburg-i-E., the beginnings of the structures still belong to the Romanesque period, the transverse aisle and the eastern towers of Freiberg minster, from the first half of the 13th century, and of Strasburg minster, the entire eastern structure, begun in 1179 and finished about the middle of the 13th century, with the double portal represented in Fig. 48.

In Alsace the Romanesque buildings exhibit the German traits, much permeated by French and Italian influences, with an earnest and heavy character. The church of Ss. Peter and Paul at

Rosheim, dedicated in 1049 but restored in the 12 th century, strongly recalls Tuscan works by its western facade without towers but subdivided in round arched galleries. Otherwise the Alsatian churches are mostly cross-shaped pier basilicas with a crossing tower, two square western towers, between which lies a gabled portico, frequently with rectangular choir and luxuriant ornamentation interwoven with fanciful animal and human forms. The abbey church S. Murbach (1216) exceptionally places two towers over the two arms of the transverse aisle. The normal alsatian type is presented by the earnest abbey church of Maursmünster, the well preserved church of S. F. Files at Schlettstadt, and the richly treated church at Gebweiler, in which the transition style appeared quite early (it was begun in 1082).

In Swabia and Bavaria, Romanesque buildings permit the recognition of an independent style-forming power, less in the creation of the interior than in the decoration. In the churches outside the influence of the Hirsau and Cistercian schools of architecture the transverse aisle was frequently omitted. On the contrary men liked to place two side choirs beside the main choir and emphasized the eastern side by the towers erected there. In the ornamentation occurs a luxuriant though noble expression of forms in a richness rivaling the Barocco conception with wonderful animal and human figures, which are perhaps to be regarded as profound symbols. The ceilings remain mostly horizontal; only at a later time was vaulting decided upon. The cathedral at Augsburg, a pier basilica with double choir, a western transverse aisle and two eastern towers, dates from the first half of the 11 th century, but was later much rebuilt. The cathedral at Freising (1160-1205) is famous for its crypt adorned by fanciful sculptures. Regensburg is the richest city of south Germany in Romanesque churches. Its most important monuments are:-- S. Emmeran (1020-1052), a plan with double choir, double crypt, and a magnificent cloister lying beside the church, the upper minster, and the Schotten church (S. Jacob), derived from the Hirsau school and well known for its rich portal. (Fig. 49). The Swabian monuments are distinguished by great richness of ornament. In Hirsau w

was erected in 1059-1071 the church of S. Aurelius, and beside it in 1082-1091 the church of S. Peter as the mother church of the Hirsau congregation. These were followed by the abbey church at Alpirsbach (founded 1095) and the foundation church at Ellwangen, begun 1146 and completed 1233, influenced by the cathedral at Worms, the first basilica of Swabia, that was completely vaulted. To the transition style belongs the pretty chapel of Walderich at Murrhardt (Fig. 50). The minster of Schaffhausen likewise exhibits the Hirsau scheme, and also the minster at Constance (1054-1089), later transformed entirely into Gothic. The Cistercians had in Maulbronn in Swabia, in Bronnbach near Wertheim and Ebrach in Franconia their most important settlements in south Germany. The plan of the monastery of Maulbronn is more fully described in the second Chapter (Fig. 186). Of the many churches on the island of Reichenau belonging to the early period, the minster at Mittelzell is a stately pier basilica, the smaller church of Oberzell (Fig. 3) being a columnar basilica. In the parish church at Reichenhall and the church on the Petersburg near Dachau occur the alternation of supports. In southern Bavaria are also to be mentioned some hall structures, among them being the Benedictine church at Prül near Regensburg, dedicated 1110, one of the oldest completely vaulted churches of Bavaria. To the transition period is referred the older portion of S. Sebald in Nuremberg, dating from the first half of the 13th century. The most splendid creation of Romanesque art in Bavaria and in Middle Germany is the cathedral at Bamberg, whose first building was dedicated in 1012. In its place and after a fire in the year 1081 was erected a second building, dedicated in 1111. The existing third structure (Fig. 51) originated between 1192 and 1237 as a cross-shaped vaulted basilica with double choir, on which may be recognized manifold influences of Rhenish buildings. In Switzerland, next to the minster at Basle, the most important churches are the great minster and the Frauen minster at Zurich, simple and severe buildings with rectangular choirs.

The Austrian provinces adhere in church architecture to the south German type of plan without transverse aisle, with three

eastern apses and two facade towers. In the richly treated columnar portals and the architectural and ornamental treatment is frequently expressed the influence of the works of upper Italy. In the church of S. Peter at Salzburg (1131) was introduced by Saxon Augustinian canons the alternation of supports (of two columns between two piers), that also found imitation in other structures. The beautiful monastery church at Seckau (Steiermark), built 1142-1185, appears to be influenced by the Hirsau school (see Fig. 52); the rich ribbed vaults were built later). As a chief work of Austrian-Romanesque art is to be designated the noble cathedral at Gurk, a stately three-aisled pier basilica with transverse aisle, that does not project beyond the side aisles, and a splendid crypt, whose cross vaults rest on a hundred marble columns. To the transition style belong the abbey churches at Trebitsch and Tischnowitz, exhibiting a rich decorative magnificence, and the Cistercian monasteries of Heiligenkreutz, Lilienfeld and Zwettl.

In the north German lowlands, in the lack of a more suitable material, the earliest Romanesque churches were built of fragments of the erratic boulders found scattered there (foundling stones), partly also in imported tufa (like the central structure of the church of S. Michaelis at Schleswig (about 1100) or in sandstone (as the cathedral at Havelberg; 946-1170). About the middle of the 12th century and under influences from Holland and upper Italy, men advanced to the brick construction already described on page 16, for which by a proper treatment of the material were found the most suitable art forms, so far as they were not already known from foreign models. From upper Italy was brought the trapezoidal capital (Fig. 23 B) among other elementary forms, which however retained an abacus of sandstone. (Its peculiar form must otherwise have resulted of itself from the direct transition of the circular shape to the square slab). The need of other ornamentation was satisfied by friezes with consoles, interlaced round arches, bricks set diagonally (Romanesque dentils) and slightly projecting moulded bricks, with the decorative treatment of the facades by strongly accented alternation of joints. Among the monuments stands in the first rank the monastery church at Jerichow,

built 1147-1152 (near Tangermunde), a three aisled, cross-shaped columnar basilica with horizontal ceiling (Fig. 53); further the great cathedral at Ratzeburg, begun in 1178 as a regular cross-shaped pier basilica with rectangular side choirs, vaulted on the restricted system without diagonal ribs, and the cathedral at Lübeck, founded in 1173 as a Romanesque cross basilica, later transformed into a Gothic hall church. The monastic churches at Diesdorf (1161-1188) and at Arendsee are cross-shaped vaulted basilicas in the commencing transition style, whose latest climax is represented by the beautiful Brandenburg Cistercian churches at Chorin and at Lehmin in 1182-1262. (Fig. 15).

II. Scandinavia.

In Scandinavian lands Christianity acquired full control first in the second half of the 12th century. The churches of the southern architectural domain, in Denmark, on Zealand, the island of Gothland in southern Sweden and Norway, were chiefly dependent on German stone construction; thus the cathedral at Ribe (Jutland), begun in 1178 and treated in the Rhenish style, as well as the cathedral at Roskilde (Zealand), built after 1191 and following French and German influences, and the stately cathedral at Lund (southern Sweden), dedicated 1145 but only completed about 1200, a vaulted normal basilica of the German kind with transverse aisle, two facade towers and peculiar northern ornamentation, that perhaps is permeated by Byzantine-Grecian forms. (Fig. 54). On the island of Gothland the hall type is at home. It is represented by the churches at Dalham, dedicated 1209, and at Wisby, by S. Clemens, S. Broton and the cathedral. (dedicated 1225). On Bornholm, in southern Sweden and Jutland remain still a considerable number of round stone churches, consisting of a circular central building in several stories with middle pier, annular vaults and an added choir. They refer back to the prehistoric German round castles and were fortified for protection from the piratical incursions of the Vikings. * In Norway's stone architecture the English-Norman influence predominates, to which refer the heavy round piers, the foliated capitals, and the zigzag ornaments of the archivolts. (Fig. 78). The cathedral at Stavanger (1128-

1150) is a basilica with horizontal ceiling. Of the cathedral at Trondheim, the Norwegian national sanctuary, only the transverse aisle and the sacristy still belong to the Romanesque period.

** The fortress-like enclosure of most monasteries has already been referred to in volume 1, page 183. Likewise simple village churches in the times frequently agitated by wars were often equipped for defense by a construction of the tower dominating the entrance, making it capable of defense. Even the cemetery surrounding the church is frequently included within this kind of fortification.*

A separate place is taken in Scandinavian art by the wooden churches, about 80 of which are still preserved in Norway and Sweden, the most important being at Urnaes (about 1090), at Borgund (first half of the 12 th century), Hitterdal (end of 12 th century), at Gol (now transferred to Oskarshall near Christiania) and at Wang (Vang), this transported in 1844 to Brückenberg in the Silesian Erz mountains. In them is preserved the primitive German and Slavic mode of construction developed into a style corresponding to the material and the climatic conditions. Its basal form appears to have been derived from the northern house and temple (volume 1, page 168), but it very early received influences from the basilican scheme and stone architecture which already appear in the forms of capitals in the oldest church at Urnaes. (Fig. 55). The ground plan (Fig. 56) consists of a nearly square principal room carried up high and enclosed by wooden trunks like masts, around which a portico extends on all four sides, that represents the plan of the side aisles. Opposite the main entrance lies the small square choir chapel, generally ending in an apse. Around this inner room runs a low gallery, the "svalegang". This is treated as a dwarf gallery with balustrade and is marked by portal structures at the three entrances. The walls are constructed of horizontal timbers or of vertical posts set side by side, or in half timber work combining both systems. In Norway and the western provinces the vertical method predominates, but in Sweden and eastern Europe the horizontal system. In the interior the rafters remain visible or a horizontal ceiling is arr-

arranged, or even a vault-like sheathing of boards is constructed, that recalls the ~~ogee~~ section of the ship. The entire ~~w~~ woodwork frequently reminds one of the wooden construction common in ship-building. The exterior is of very picturesque form. Against the middle nucleus structure, very high and covered by a gable roof with roof turret, first leaves the shed roof over the inner gallery (the side aisles) and the choir, further below being the continuous roof of the ~~svalegang~~, the shed roofs over the entrances being interrupted by small gables, the whole uncommonly adapted to throw off and separate the masses of snow. (Fig. 55). Great interest is afforded by ornaments incised in special parts of the structure, especially in the portal jambs and lintels, in which the ancient German animal and band interlacings perform real orgies in an inexhaustible wealth of invention. (Fig. 57).

III. France.

Still more sharply than in Germany, in the different provinces of France are expressed the national diversities of the people in Romanesque architecture. The southern half was once a Roman province. There was developed indeed a rich, varied and expressive art. But it was directly based on the antique, whose effects were frequently strengthened by direct currents from the East, and so made but little of its own, that we have so far designated as Romanesque in the narrower sense. The hereditary population even there was affected by German blood only in slight measure. The primary conditions of the development of art in northern France were different. There the Celts and Normans formed the predominant portion of the population, and thus also there the Romanesque art, permeated by the German spirit, found a fertile soil. The entire course of Romanesque art in France, as in Germany, is characterized by the method of construction of the ceiling, and particularly by the vaulted construction, that we have already described in connection with the general treatment of the ground plan and the interior. (Page 13).

In southern France are to be mentioned only a few basilicas with horizontal ceilings:-- the ancient and venerable church of S. Martin en Tours (see volume 1, pages 176, 181), a cross

basilica with five aisles, restored in 997, the abbey church of Cluny, dedicated 981 (page 28), two epoch-making creations, but which have almost entirely disappeared, and S. Aphrodisie at Beziers, this influenced by the facade of the cathedral at Pisa. The impulse toward vaulting set in with the tunnel vaulted hall church of a single aisle (see page 13), among which the cathedral of Notre Dame at Avignon (about the end of the 11 th century) and the grand and spacious cathedral of Toulouse, commenced at the beginning of the 13 th century, but not completed in the pure style, represent the most important works. Of the domed churches of Aquitania (see page 13), the cross-shaped abbey church of Fontevrault, single aisled and to be referred to the second half of the 12 th century, and the cathedral of Angouleme are to be emphasized. (Fig. 58). The influence of Byzantine works is there unmistakable. The mighty church of S. Front at Perigueux (after 1122) entirely passes over to the Byzantine normal scheme with five domes already adopted by S. Marco in Venice.

More commonly than single aisled churches are found in southern France the tunnel vaulted hall churches. S. Honorat at L Lerins (Fig. 59) is covered by three parallel semicircular tunnel vaults in the side aisles, but in the middle aisle are pointed arches and tunnel vaults. The churches at Grandson in Switzerland and at Fontfroide exhibit half tunnel vaults in the side aisles; in the middle aisle the former still has a round arch, but the latter already a pointed arch as the vaulting line. In the church of S. Savin the side aisles already have cross vaults and likewise in Notre Dame la Grande at Poitiers (Fig. 60), famous for its peculiar facade. The tunnel vaulted hall churches with galleries reach a splendid development in Auvergne in Notre Dame du Port at Clement-Ferrand, a cross-shaped and three aisled plan with columnar aisle and circle of chapels, cross vaults in the lower and half tunnel vaults in the upper side aisles, and a massively treated dome over the crossing, also further in S. Paul at Issoire (Fig. 61), as well as in higher degree after the same arrangement, in the colossal church of S. Sernin (Saturninus) at Toulouse (from the 12 th century), yet built with five aisled nave and three aisled transepts.

The tunnel vaulted basilicas of Provence are best represented by S. Paul in Trois-Châteaux and S. Trophime in Arles, both dating from the 12th century, the former with round arched, and the latter with pointed arched tunnel vaults. S. Trophime in Arles is well known by the beautiful portal, richly adorned by sculptures, that we judge to be the work of an early Renaissance. The church of S. Gilles (begun 1116) is worthy of consideration for the early occurrence of ribbed vaults above the crypt, as well as by its beautiful portal, that like that of S. Trophime is treated with Corinthian columns entirely in the classical sense. In Burgundy, the later abbey church of Cluny, built 1089-1095, was destroyed by the French revolution (page 28), but was of standard importance. It was followed by the cathedrals of Autun, Vienne and Lyons. In the cathedral of Langres and the abbey church of Vézelay in northern Burgundy (page 29), the tunnel vaults were also supplanted by cross vaults. Likewise the mother church of the Cistercians at Cîteaux no longer exists. A correct representation of its construction (page 29) is given to us by the abbey church at Pontigny, erected about 1150, but whose rectangularly enclosed choir was replaced about 1180 by a polygonal one, with aisle and circle of chapels. With this choir plan, the ribbed cross vaults developed to full maturity, and the carefully graduated treatment of the piers in accordance with the system of ribs, this church bears all the marks of the latest transition style.

Everywhere in northern France prevails the basilican type. Hall churches and single aisled churches only occasionally occur, at least in the larger designs. The horizontal ceiling was retained until in the last quarter of the 12th century. The great church of S. Remy at Rheims (1005-1049) with five aisled nave, three aisled transepts, choir aisle and circle of chapels, still leaves the ~~framework~~ of the roof open to view. Horizontal ceilings also had the abbey church of Jumièges, now remaining only as an expressive ruin, with piers and columns alternating after the Saxon manner, and also the great abbey churches of S. Trinité and S. Étienne at Caen, which however received cross vaults later, about 1200.

About 1050 the great architectural activity of the Normans

commenced. Their normal churches were cross-shaped pier basilicas on the restricted system, the side aisles continued beside the choir square to the beginning of the semicircular apse of the choir and then closed square. The side aisles have galleries, and above these extended other galleries, in which are the windows. From the piers project half columns with capitals like corinthian in earnest and plain forms. In the cornices are especially favored small consoles with heads of animals etc. Three towers, one over the crossing with a high pyramidal roof and two on the facade, animate the exterior of the architectural group. Generally on the soil of northern France, Lombard are crossed with German influences. A rapid advance is made by vaulted construction. Already the church of S. George at Boscherville, erected between 1154 and 1157, has in the middle aisle a completely developed system of ribbed cross vaults. In S. Etienne at Beauvais (about 1125) the middle aisle is covered by round arched ribbed ~~cross~~ vaults. The church at Airaines (about 1130) already introduces the pointed form for the transverse arches. The abbey church of S. Germer near Beauvais (about 1145) exclusively employs the pointed arch in the vaults and the openings in the walls. They might already be assigned to the succeeding art period; except that the buttress system (see page 79) is still undeveloped, since it is concealed beneath the roof. But in the later monuments originating after 1150 was perfected that extraordinary transformation in construction and forms, with which the new system of the Gothic commences.

IV. Italy.

The great movement in architectural history of the Romanesque period in the German lands of middle and northern Europe was not transplanted in its entire strength beyond the Alps. Italy was already so richly supplied with church buildings, that no such large field remained for the activity of mediaeval art. Likewise the northern races affected Italian art in very unequal measure according to the mixture of races, most successfully on the soil of upper Italy, already prepared by the Lombards, and in the former Norman kingdom of the Italian South. Everywhere the German natural spirit, accustomed to

the simple and natural and inclined toward spiritual depth, brought new life into the petrified, formal antique with a Byzantine flavor and combined with Early Christian art. Its joy in treatment and abundance of forms combined with the classical tendency peculiar to the Italian conception of art into an extremely fortunate harmony, just as on the other hand the freedom and light spaciousness of Italian buildings reacted on the connected strength of the massive and dark structures of the northland in the most favorable manner.

In most cases the churches followed the basilican scheme with or without galleries, yet always with a free treatment of the restricted system. The ancient T-form of ground plan (see volume 1, page 176) was not always extended to the cross-form. The transverse aisle frequently remained unmarked; over the crossing rose a polygonal dome. The bell tower stood as earlier beside the building without organic connection therewith. (Fig. 62). The Tuscan churches lacked the crypt. In Lombardy and lower Italy it was developed in the richest manner. As supports columns and piers continued in use, sometimes also in alternation. For vaulting, the cross vault was almost exclusively employed, with the exception of some churches of upper Italy influenced by France. Yet horizontal ceilings and the visible framework of the roof also remain in favor as previously. On the facades the horizontal subdivision expressed in a antique buildings reacts in the strongly emphasized main cornices. The preference for columnar construction led to an abundant use of triforiums. The surfaces of facades appearing in great width by the lack of towers was frequently animated picturesquely by facings of light and dark colored band courses and friezes. (Fig. 18).

Besides the basilican, the hall type occurred occasionally. The central plans are found in community churches chiefly in the Byzantine provinces of the South and in Venice (see volume 1, page 194); but simple ~~central~~ or polygonal buildings are quite generally scattered over all Italy, occurring as baptisteries erected near the principal churches.

Lombardy preceded the North in time in the rise of certain forms of treatment characteristic of Romanesque art. Wall strips and arched friezes were already represented in the art of

42 Ravenna (volume 1, page 157), and blind arcades on small columns with consoles among the Lombards (volume 1, page 171). But in reference to the covering of the middle aisle with cross vaults, so important to the development of the Romanesque style, the precedence is not important. It was first adopted for the church of S. Ambrogio in Milan, (Fig. 63), newly built in 1046-1071 over a three aisled ground plan without transverse aisle and with galleries over the side aisles, the middle aisle strongly elevated but without windows in the clearstory, the groin lines of the main vaults enlarged by diagonal ribs in brickwork, which rise from round projections of the piers shaped like angle columns. Before the western facade opening in loggias lies a forecourt enclosed by arched porticos on piers, whose existing structure dates from the beginning of the 12 th century. (After 1117). The fanciful and almost fearful animal figures in the ornamentation indicate a peculiarity of Lombard sculpture. (Volume 1, Page 209). The system of S. Ambrogio was carried to a happier solution in S. Michele in Pavia toward the end of the 11 th century, when the middle aisle was extended so high above the side aisles, that windows could be inserted in the clearstory walls. The most perfect creation of Lombard-Romanesque art is the cathedral at Parma (dedicated 1106), where the transverse aisle and choir are arranged according to the crossing square, as in Germany. Likewise the cathedral of Trient (after 1212) follows this design, yet with rejection of the restricted system, and the arrangement of rectangular bays in the middle aisle, that also reappears in the church of Ss. Peter and Paul at Bologna, a structure with alternation of the supports. The cathedral of Piacenza substantially adheres to the school of Pisa (see page 51). To the basilicas with horizontal ceilings also originally belonged the cathedral of Modena (begun 1099; Fig. 62), a structure with alternating supports, in which open round arches are turned between the piers, walled above to receive the ceiling; in the 12 th century the bays thus formed were afterwards covered by cross vaults. Artistically more important is the noble church of S. Zeno in Verona, a basilica with crypt and alternation of the supports, in which the system of open arches with horizon-

horizontal ceiling yet remains in its original condition. The portal dating from 1139 (Fig. 65) has rich sculptured decorations and a door entirely covered by Romanesque reliefs in bronze. On S. Zeno, as well as on the cathedral of Modena, the vertical subdivision expressed by wall strips and half columns is striking, as well as the splendid wheel window in the gable of the middle aisle and over the main portal.

In the western provinces of upper Italy, at first belonging to France, are also commonly found (also occasionally in the remainder of upper Italy and especially in Milan) tunnel vaulted hall churches, similar to those of Provence. But in the east, in Venice, all Romanesque architecture stands under the overpowering influence of that magnificent triumph of Byzantine-mediaeval art celebrated in S. Marco. (See volume 1, page 194).

In Tuscany all Romanesque architecture developed under the strongest influence of the antique. The classical conceptions and treatment of the architectural masses here appear on the soil, once occupied by the ancient Etruscans, with a certainty and clarity, that must be striking in this portion of the country, in which so few remains exist from antiquity, and that can only be explained by the particular inclination of the people and their animated relations with Rome, where the antique-Early Christian spirit maintained itself alive until in the beginning of the second thousand years. The old basilican style with horizontal ceiling or visible framework of the roof passed into Romanesque art. But the exterior received a rich and splendid architectural treatment, in which the classical columnar and arcade construction came into its full rights, and the colored animation of the surfaces had wide scope. Nearest the antique stood the magnificent buildings of Florence:- S. Miniato (11 th century), the nobly located hill church at the southeast above the city, a three aisled nave (without transverse aisle) with alternating supports, open arches, visible framework of the roof and a facade, that is interesting as classical; the baptistery (12 th century) on the cathedral Place, an octagonal structure, containing an undivided interior vaulted by a dome and a facade with entirely antique treatment. The chief creations of Tuscan architecture stand in Pisa. They t

there combine in a grand architectural production, which produces in every one an unforgettable and even overpowering impression, who visits the quiet and broad Place at the northwest end of the city. On the middle stands the mighty cathedral, begun in 1063 by the architects Busketus and Rainaldus and completed in 1118. There clearly appears already in its external appearance the Latin cross, formed by the intersection of a five aisled nave with the three aisled strongly projecting transepts. The nave terminates at the east in a semicircular choir apse; the cross arms end in smaller apses. The middle aisle extends above the shed roofs at the sides; the crossing is crowned by an oval dome. Blind arcades and pilasters subdivide the external surfaces. But the western facade is entirely subdivided into arched galleries in several stories, in the manner characteristic of the Tuscan school, and even extending beneath the inclined edges of the roofs. (Fig. 66). On the interior 68 granite columns, partly with antique capitals, brought from afar, support the walls, on which rests the wooden ceiling of the middle aisle, while the side aisles are provided with Romanesque cross vaults. The internal walls are covered by white and dark green marbles. The entire interior makes a unified and solemn impression, airy and elegant, light in comparison to northern buildings. Near the main apse rises the campanile (Fig. 67), the famous leaning tower, erected about 1174 by Wilhelm of Innsbruck and the Pisan Bonannus, * that harmonizes finely with the cathedral structure by its columnar arcades surrounding it in six stories. Opposite the western facade of the cathedral stands the baptistery, executed in the same style (the superposed Gothic decorative gables are later additions), built 1153 by Diotosalvi as a great circular central building (100.1 ft. diameter), the interior with outer aisle in two stories, covered by a steep and almost conical dome. Yet other churches in Pisa exhibit the same treatment of the facade as the cathedral, also S. Michele in Lucca (1160-1239) and S. Giovanni-f-c in Pistoja. S. Andrea there (Fig. 18), a basilica from the 12th century with a narrow middle aisle adopted Florentine influences in addition to Pisan. Even as far as Dalmatia (cathedral in Zara, begun 1247), the Pisan school exerted its influence. A separate place is taken by

the cathedral at Ancona (Fig. 70), built 1128-1189. Caused by the location of the city on the Adriatic Sea, Byzantine influences affected it. The ground plan forms a Greek cross, consisting of a three aisled nave, three aisled transepts of the same length and with apses at their ends. The crossing is crowned by a dome with 12 sides. The Ravenna-Byzantine columns indeed date from an earlier building.

** The oblique position was produced by settlements (resulting from the yielding of the ground at one side), which occurred during the construction and could no longer be remedied.*

In Rome and the surrounding Umbrian province the Romanesque style could obtain no firm foothold. Architecture adhered to the Antique-Early-Christian basilican scheme with visible roof framework or horizontal ceiling and firmly to Roman architecture, busying itself less in the establishment of new churches, than in the rebuilding and maintenance of earlier works, and their rich architectural decoration. Besides S. Maria in Trastevere in Rome (about 1139), no remarkable rebuilding occurred. S. Lorenzo-f-l-M (volume 1, page 159) received the front church at the beginning of the 13th century: the structure of the 5th century remained as choir. Among the churches outside Rome are to be mentioned two beautiful works in Toscanella (near Viterbo), S. Pietro (Fig. 68), built 1039-1090, and S. Maria (1050-1206), both three aisled with noble treatment and with a rich facade.

But in one respect the middle ages fertilized the antique to new life in the ornamental works in stone on altars, pulpits, choir enclosures, and particularly in cloister courts. By the artist family of the Gosmati, whose activity falls in the period from 1090 to 1332, was developed an individual, finely conceived and very charming mode of ornamentation, that chiefly consisted in the decoration of architectural members taken from the antique with mosaics of bits of brightly colored marbles. What these head masters of mosaic decorative art have magically produced in noble form and splendid color in the Roman cloisters of the monastery near S. Paolo-f-l-M (1220-1241), erected by Petrus of Capua and Master Petrus, and S. Giovanni in Laterano, built in 1222-1230 by the two Vassaletus, father

and son (Figs. 21, 59), belongs to the most beautiful and most harmonious of all, that mediaeval art has brought forth anywhere.

Until the middle of the 11 th century, Italy was under Byzantine rule, and later till the middle of the 12 th century, under that of the Normans and Hohenstaufens. German traits are there combined with Byzantine, and also in part with Saracenic traditions. The churches are throughout basilicas with transverse aisle, that the apses adjoin directly, middle aisle with horizontal ceiling and cross vaults in the side aisles. The cathedral of Salerno (begun 1077) was later transformed into a pier design with tunnel vaults. Completely modernized are the neighboring cathedrals of Amalfi and Ravello. On them the stilted round arches and the intersecting blind arcades indicate the influence of Sicilian architecture. Stronger appears the German basal element in the east of the Norman kingdom of lower Italy, in the country of Apulia. The cathedrals of Bari (begun 1234) and of Troja (1093-1119) are columnar basilicas. At the cathedral of Trani each two columns are coupled. A peculiarity of the churches consisted in the largely planned and richly equipped crypt. In the cathedral of Trani the crypt extends beneath the entire upper church; in S. Maria at Foggia it is completely developed as a lower church. With few exceptions (for example the cathedral of Troja treated in an antique sense), the facades here by the subdivision with wall strips, arched friezes, triforiums and the like, frequently recall the buildings of upper Italy and the north; in several cases towers are even included in the structures in permanent connection with the facade. In the interior fully appears the love of splendor native to the South. Here chiefly the marble workers (marmorai) called by Desiderius of Mt. Cassino, again revived the antique opus sectile (volume 1, page 148) and brought it to high perfection. Their style of decoration enjoyed such approbation, that it found the most extensive employment in lower Italy, in Sicily, and in Rome as far as Tuscany. *

* *The technical methods of the marble workers differed from those of the Cosmati, in that they cut the different figures of the ornaments (bands, foliage, palm leaves etc.) out of thin marble slabs and cemented them in the corresponding recesses*

of the architectural members to be decorated, while by the Cosmati the figures were composed of very small bits of marble arranged according to the general surface patterns.

In Sicily, that peculiar island so very richly equipped by nature, which was successively ruled by Greeks, Romans, Goths, Byzantines and Saracens, western art in the 12 th century and under the blessed rule of the Norman princes passed through a wonderful climax. In an extremely fortunate way were combined these traditions of the earlier forms of civilization in order to give to architecture their best, from the Greeks the spirit, thinking for beauty, that would create the art work for itself, from the Romans the practical ground plan according to the model of the basilica with horizontal ceiling, from the Byzantines the advantages of the central plan, dome construction, and the costly facing with brightly colored marble slabs and splendid mosaics, from the Saracens the luxuriant and purely decorative use of arcade construction, the stalactite pendentive (see volume 1, page 209), and the splendor of color poured out over the entire interior. The Normans then completed the architectural creations so produced in their sense by the addition of towers in their facades and their monumental architectural treatment. The magnificent Martorana at Palermo (Fig. 71) has already been mentioned (see volume 1, page 194) as a purely Byzantine church; nearly allied to it is S. Giovanni d'Ermeti (founded 1132) as a church with five domes, yet with a substantial approximation to the western basilica, by the arrangement of the building as a nave with transverse aisle and three apses. The palatine chapel constructed in the royal palace at Palermo, famous for its strong interior (1129-1140), is a three aisled columnar basilica with a high dome over the crossing. The pure basilican type with horizontal ceiling is represented by the cathedral at Cefalu, dating from the first half of the 12 th century, whose western facade with vestibule is flanked by two massive and entirely Romanesque towers, by the cathedral of Palermo (1169-1185), but of which only the crypt, the internal columns, the choir apse and the detached double tower, now belong to the Romanesque structure, and by the cathedral of Monreale (1174-1189), a three aisled cross basilica with

56 western vestibule between two towers and a richly decorated portal, the best preserved and most important monument of the Sibilian style. The choir apse, as on the cathedral of Palermo, here exhibits the characteristic blind arcades with the arches intersecting each other. (Fig. 72). By the extremely rich mosaics of the interior is a grand show piece of genuine southern cheerfulness and fabulous splendor produced. Near the cathedral also lies that picturesque cloister court known to the world (1200-1221) with coupled columns and pointed arcades, not only the largest, but also by far the most important of all cloisters in Italy by the magnificence of the shafts of the columns inlaid with mosaics and the beauty of the sculptured decoration of their capitals.

V. Spain and Portugal.

After the founding of the Spanish Mark (province) by Charlemagne, Christian Visigothic princes penetrated beyond the Pyrenees, and after hard contests with the Moors (see volume 1, pages 203, 208) founded the Christian kingdoms of Leon, Castile, Navarre and Arragon, which comprised nearly all the northern half of the peninsula, and in part combined together. With the rise of these kingdoms, the blooming of chivalry, the complete expulsion of the Moors from the north and their retirement toward Granada (about 1250), Spain entered upon a national advance, which was likewise expressed in the art. Indeed this was not brought to a free and permanent development. As in the time before the middle ages, also in the Romanesque period was it dependent on foreign influences, particularly in great measure from the adjacent southern France, also partly on Lombard, German and Moorish art forms, whose effects were sometimes recognized in the general design and construction, sometimes in the architectural treatment and ornamentation, according to the relations of the master, of the architect, and of the executing artists.

Still entirely dependent on Moorish art stands the church of S. Maria la Blanca in Toledo. (Fig. 73). The interesting building is arranged in five aisles. The four arcades dividing the interior lengthwise rest on octagonal plastered brick piers with remarkable capitals ornamented by beaded bands, from which rise horseshoe arches.

The Romanesque churches as a rule are based on the form of the Latin cross as a three aisled and not very long nave with transverse aisle and choir. This consists either of three (seldom five) axes lying on the axes of the aisles or of one apse with a choir aisle, formed by continuing the side aisle around the middle choir and its extension by a radiating circle of chapels. Peculiarities differing from this general scheme are only shown by the Spanish churches by retaining the external arched portico along the sides (volume 1, page 172), by the insertion of a high choir for priests in the middle aisle, and a particularly rich treatment of the crossing tower. (Cimborio or crocero). In regard to the structure, three types are represented:-- the simple hall churches, the hall churches with galleries, and the vaulted basilicas. The horizontal wooden ceiling is found in but a few churches. (S. Millan and S. Lorenzo in Segovia). Already the oldest Romanesque buildings were covered by tunnel vaults in the middle and side aisles, where also half tunnel vaults found employment in the side aisles as in southern France. Later came the subdivision by transverse arches, then the covering of the bays by cross vaults, first in the side aisles and then in the middle aisles, the ribbed construction finally finding admission in bold development with particular prominence of the ribs by means of attached stars, lozenge ornaments, rosettes and the like. To the tunnel vaulted hall churches with choir square and one apse belongs S. Maria at Corunna, to those with galleries the great pilgrimage church of S. Jago (Santiago) de Compostella, completed 1188, with three aisled nave and transepts, the latter projecting far beyond the side aisles, choir aisle with a circle of chapels, and vestibule with a great porch most richly adorned by statues and sculptured ornamental work. The similarly arranged church of S. Isidoro at Leon (dedicated 1149) already employed cross vaults for the side aisles. In the 12th and 13th centuries originated some cross vaulted basilicas as important monuments with energetically subdivided piers and developed vaulted construction, among which as a chief work is the (old) cathedral of Salamanca (after 1120) with transverse aisle (Fig. 74), triapsal choir and very rich crossing tower,

that rises with sixteen sides in two stories, flanked by four round turrets. In a similar way the foundation church of Toro is crowned, in whose massive domed tower numerous Moorish forms found acceptance. The beautifully located cross-shaped church of S. Vicente at Avila with three apses has a broadly developed western facade, with two low towers and an arcade portico between them, and a very richly sculptured double portal. (Fig. 75). Expressed northern influences are shown by the pier and vault construction of the vast cathedral of Tarragona, a cross-shaped basilica with five apses; it first originated in the 13th century and already characterized in the cross ribs and pointed arches the last stage of the development of the Spanish Romanesque style.

Separate places are also occupied on the Pyrenean peninsula by the Cistercian churches on account of their rectangular choir and rectangular side chapels, as for example Las Huelgas near Burgos (1180-1182), and by the central designs of the Christian knights (Templars), among which is to be named in the first rank La Vera Cruz near Segovia (1150), a polygonal structure of twelve sides with three apses and square bell tower. (Fig. 76). To the finest show pieces of late Romanesque art belong also some cloisters, as for example that of S. Pablo at Barcelona, on which Moorish foiled arches and ornamental motives are fused with Romanesque decorative forms into a very charming style of ornamentation. *

* Also see Fig. 86.

Portugal first obtained its political independence in the year 1139, but in its art continued in entire dependence on Spain and western France. As its most important monuments still dating from the Romanesque period are:-- the ancient cathedral of Coimbra, dating from the middle of the 12th century, a three aisled and tunnel vaulted pier basilica ending in three apses and with battlemented external walls extending high above the roof, so that it makes the impression of a fortress. The Templars' church at Thomar, built in 1162, in which around an octagonal two story nucleus structure extends an aisle of equal height with a tunnel vault and enclosed in a polygon of sixteen sides, and the three aisled hall church of the Cister-

Cistercians at Alcobaca (1148-1222), that indeed shows the usual rectangular chapels on the east side of the transverse aisle, but terminates with a polygonal choir aisle lying behind these, that already exhibits the basal traits of Gothic in its pointed arches and vaulted construction.

VI. England.

In the year 1066 the Norman duke William the Conqueror with 60,000 soldiers from northern France undertook his great campaign into England, conquered the Anglo-Saxon king Harold near Hastings, took possession of his kingdom and divided the land among the Norman nobility, while the native population sank into the position of subjugated citizens and peasants. Thereby the architecture of the Normans found admission into England, but there experienced changes of many kinds under the reaction of the native style of architecture and with regard to conditions otherwise changed.

The previously common basilican scheme with alternating supports, galleries and strongly developed crossing tower (see volume 1, page 175) was also retained for the future. In order to provide space for the clergy, greatly increased by the flocking of monks from the continent, men gave the choir an unusual length (so that it appears like a continuation of the nave beyond the transverse aisle) with a rectangular ending as a rule, and without a group of chapels. (Fig. 77). The transverse aisle was therefore transferred to nearly the middle of the likewise very much elongated nave. It was arranged with strongly projecting transepts, generally enlarged toward the choir by a side aisle, in order to there receive chapels for establishing side altars as in the Cistercian chapels. Frequently these aisles are arranged in the transepts. Aside from the otherwise determining influence of the Cluniacs, the crypts were not omitted.

The structure (Figs. 78, 81) begins with unusually thick walls and heavy piers, subdivided after the Norman custom, or particularly for small churches, with strikingly stumpy round piers laid up in courses of small stones, whose form recalls old Saxon prototypes. The openings to the galleries approximated the character of triforiums by the insertion of a middle

column with arches, and which extend above them in the great cathedrals. In the capitals almost exclusively prevails the cushion type in the change to the scalloped or folded capital (Fig. 79), so characteristic of English art. Heavy rounds with frets and zigzag bands, that are repeated to superfluity, enclose the arches. (Fig. 84). Slender half columns rise from the piers but remain without structural importance, since they support no stone vaults. Only the side aisles are covered by cross or sometimes by half tunnel vaults, the galleries also with wooden construction. But although their pier forms indicate vaulted construction, the English churches all have horizontal wooden ceilings (with the exception of the cathedral of Durham), which are often splendidly painted and gilded. The portals mostly open in a full semicircle, more rarely with a quite depressed pointed arch; the tympanum then disappears. The external impression is dominated by the massive crossing tower, that terminates without spire and in a horizontal series of battlements. If western towers were exceptionally erected, which then have the same fortress-like appearance, they project somewhat beyond the facade and enclose a small porch between them, or they are placed beside the side aisles, whereby either the porch entirely disappears or is transformed into an entrance portico occupying the entire width. The broad, round enclosures of the doorways and windows, often treated with frequently coupled slender half columns (Fig. 83), in combination with projecting wall strips and arched galleries, slightly projecting and often with repeated horizontal bands and the crowning battlements, form the most important members of the external architecture. In the general appearance (Fig. 80) the English-Romanesque architectural works make a bold and grand, though also a severe and dry impression. The masses of the building seem less enclosed by the strongly projecting transepts, than the cathedrals on the continent, whereby is somewhat obviated the heavy effect of the masses produced by the towers without spires. Likewise the interior calls forth the same expression by the extraordinarily stumpy piers; by the abundant use of ornaments--almost exclusively zigzag and fret bands, diamond and interwoven scrolls, stars, waves and the like (Figs. 78, 84)-- this is softened but little.

25 The oldest structures, as for example the chapel of S. John in the Tower at London (Fig. 81), erected by the military architect of William the Conqueror, are very simply treated with stumpy round piers, plain walls and tunnel vaults. To the principal churches of the developed English-Norman style belong: the cathedral of Winchester (1079-1093) with an extended crypt, later frequently restored and transformed; the cathedral at G Canterbury, dating from the same period, of which indeed only the grand crypt (Fig. 82), certain parts of the choir and the towers of the Norman structure remain; the cathedral of Ely (1082-1174), which still affords a beautiful example of the rich Norman style of the 11 th century in its three aisled transepts with galleries, triforiums and blind arcades, but otherwise and on the facades is evidently rebuilt; the cathedral of Gloucester, founded 1089, whose round piers in the middle aisle and especially in the crypt indeed assume colossal diameters; the cathedral at Norwich (after 1096), grandly planned with great dimensions and well preserved with the exception of the later middle aisle and of the tall Gothic window of the f facade, (Fig. 83); the cathedral of Peterborough (Fig. 77) (1140-1193), an imposing work, that must purely exhibits the Norman style by its ancient wooden ceiling in the middle aisle and the heavy ribbed cross vaults in the side aisles, but on the facade by the great openings of the entrance porch, and the pointed arches already show the invasion of new conceptions.

67 Likewise in the abbey church at Waltham, a structure with alternating supports, round piers and richly treated details, is Norman art represented in its purity. These churches with round piers (at Waltham, Gloucester etc.) make a more satisfactory impression internally with their horizontal ceilings, than the chathedrals with the much subdivided piers (at Winchester, Ely, Norwich and Peterborough), since these (at least originally) lack the vaults prepared for by the plans of the piers. only the imposing cathedral of Durham (1093-1123) proceeded to the completion of its system, when it also covered the middle aisle by ribbed cross vaults. (Fig. 78). The exterior (Fig. 80) allows the subdivision of its structural masses of the English cathedrals to plainly appear; the galilee chapel (Fig. 84),

is a show piece of English-Romanesque architecture strikingly characterizing the style.

As exceptions to the general scheme of the Norman churches are to be mentioned some central plans ascribed to the Templars, the tomb churches at Cambridge and Northampton, each with eight internal supports and an outer aisle, as well as the Temple church in London (S. Mary's church), erected 1185, a corc-ular structure with slender compound piers of four columns to support the ribs and pointed arches. Likewise into the English nave churches the pointed arch early penetrated, evidently by the mediation of the Cistercians, indeed at first only in the arcades, while men characteristically still firmly adhered to the wooden ceilings. But in the last quarter of the 12 th century the innovations came in so, that already at this time men entered into the Gothic period in England, thus considerably earlier than in Germany.

B. Romanesque Secular Architecture.

Besides the grand creations of interiors in ecclesiastical art, the secular architecture of the Romanesque period occupies only a very modest portion, at least in the earlier period, but from the middle of the 12 th century onward, it acquired constantly increasing importance by the advance of city and castle architecture. The Romans already had founded numerous settlements on the soil of ancient Germany, particularly in the Rhine and Danube provinces, first as castra (regularly arranged and well fortified military camps; see volume G, page 128), and then from these settlements were derived populous cities (Strasbourg, Mentz, Frankfort, Treves, Cologne, Xantes, Bassau, Regensburg etc.). In them may yet sometimes be recognized certain straight streets intersecting each other at right angles in the midst of the otherwise so irregular network of the alleys of the oldest quarters, the former streets of the Roman camp. But most early mediaeval cities originated (aside from the direct foundations by the princes, as for example Goslar by Henry I, Bamberg by Henry II) from small settlements of an agricultural or industrial sort on sites favorable for them, especially on navigable rivers, at the intersections of important traffic routes etc. * By the resulting gr-

grouping of buildings without any definite system, there originated an almost planless labyrinth of alleys, large and small, at about the middle of which were erected the bishop's cathedral and palace, frequently in connection with a monastery design. Besides these more important structures scarcely any but the residence of a ruler acquired a prominent position.

** Regular plans of mediaeval cities with a rectangular network of streets, such as occur in southern France and in the northeast provinces of Germany, are always to be referred to systematic foundations, in Germany chiefly to the Teutonic Order of knights, whose grand master had his chief seat in Marienberg after the year 1309, from whence was developed a strong activity in colonization.*

The cities then received fortifications at a very early time, mostly by a high wall furnished with slots for shooting, battlements and with inner defensive passages, and which was occasionally strengthened by small rectangular towers. (Fig. 85). Only the gate towers over the vaulted entrances through the city walls were constructed with particular strength and designed with architectural decorations in the forms characteristic of the country. (Fig. 86). The exterior was preferably constructed with bossy ashlar, which gave an unusually solid and safe appearance, while the internal side, where protection did not seem necessary, was formed by weaker walls, half timber or wooden construction, sometimes being left entirely open. In the 13th century the gates over the main entrances were developed into defensive buildings of two or three stories with a high tower rising above the roof or even with two flanking towers (one of the most beautiful examples of this is presented by the Romanesque gate at Comburg near Schwäbisch-Hall). Men soon decided for further securing the entrances to place opposite them a separate advanced structure defended by towers. About the end of the 13th century, they commenced to excavate a ditch before the walls and to fill this with water, if possible.

Within these walls and with the rapid growth of the city, only a very small area could soon be assigned to the separate dwellings of the citizens. They must be developed in height

rather than in width and to be quite sufficient for light and air. A generally followed scheme could not be established for the ground plan. The ground story was intended for the practice of the calling as merchant or mechanic; the upper stories served for residence. Almost always with reference thereto, the steep roof could not be allowed to slope toward the narrow street, but the house facade had the gable turned toward the street. The houses of the simple citizens mostly consisted of a low stone substructure only extending but little above the ground level, but otherwise of half timber work, posts and girts, whose panels were filled with bricks, or with interwoven wooden strips with a mixture of straw and clay and then plastered. About the middle of the 12 th century the half timber work in certain cases was changed into stone construction, indeed at first only in the ground story, which was sometimes covered by cross vaults on heavy stone piers, while the half timber work was still long retained for the upper stories. Later, in the 13 th century, also originated citizen's houses of stone in several stories, on which the endeavor for a monumental architectural appearance and the joy in ornamentation appeared. Their gables are always stepped. Such stone houses or their remains are found at Cologne (house on wool market and the Overstolz house at Cologne; Fig. 87), at Boppard, Aix-la-Chapelle, Treves, Metz, Gelnhausen, Saalfeld in Saxony (the beautiful purely Romanesque city pharmacy) and particularly in Regensburg, that city rich in Romanesque monuments. Also in France, in the south as well as in the north, certain citizen's houses in the Romanesque style still remain (for example in Cluny and Caussade), Likewise in England (at Lincoln) and in Belgium (Ghent).

Little attention is paid to capability of defense on these citizens' houses. The patricians and nobles taking part in the government of the city, who had their residences in the city, already took greater care for their personal safety in the usual internal contests and street fights. They arranged the first story, and often the second, for defense, even building dwellings in the form of strong towers with very thick walls and elevated entrances. Thus originated the mediaeval li-

living towers, that mostly contained the council chamber in the lower story, in the second being the space for the kitchen and servants, in the third for the family, over which was the men's (knights, state) hall, and finally the chamber for the tower watchmen and the place of defense (platform) with a series of battlements. This design of tower (Fig. 88) is a commonly occurring form of the dwelling (termed donjon in France, keep in England), but it in Germany but seldom. Great residences of rulers within the cities were yet chiefly strongly fortified by moats, enclosing walls and towers, and they then formed the nucleus of the city fortifications.

Romanesque stone construction attained to increased importance by the erection of necessary fortress-like dwellings for the ruling nobles in the country, castle architecture, whose origin in its present sense falls in the change from the 10 th to the 11 th century. Both by choice of site as well as by the entire plan and construction were utilized the advantages afforded by the location, steep slopes of hills and watercourses, for effective defense as much as possible. (Fig. 89). Already therefore men nearly always departed from a certain geometrical regularity of plan. The latter was limited in the oldest and simplest form to the keep, the castle court and the enclosing walls. The keep, an octagonal or circular, rarely polygonal, unusually strong and high tower, whose entrance lay on the most protected side (sometimes 49.2 ft. above the ground) and could only be reached by ladders or easily removable wooden stairs; it served as watch tower and defensive building, and in the first period (in France and England even still later, but in Germany always more rarely) for a dwelling, then having the already described division into stories with a corresponding internal width (for example, at castle Augenstein near Basle, 32.8×39.4 ft.). About the end of the 11 th century the dwelling was almost always arranged in a separate building. The keep then came into consideration only as a place for retreat, or the last place of recourse, and therefore its width could be considerably reduced.

The dwelling of the nobles, the palace, then became the proper monumental structure of the castle. It substantially consisted of a hall building, rectangular if possible, with open

flight of steps and coupled round arched windows, which sometimes extended along the entire inner side as an arcade, containing in the ground story the kitchen and offices, in the second generally the great hall divided in two aisles by a row of supports (Figs. 91, 93), beside it being the chapel (in great castles). If a third story existed, then in it were the smaller warmed living rooms (kemenate), in case they were not placed in the second story or in an adjoining building.

Subordinate structures for the servants, the garrison and the stables were established separately in the castle court or at suitable places within the enclosing wall. To the preservation and increase of the capacity of resistance to attacks a also was devoted a watchful eye. Like the city walls, so the enclosing walls at the entrance to the castle and other dangerous places were defended by strong towers. (Fig. 90). Very commonly the entire castle was enclosed by a second or third external enclosing wall and one or more outlying forts, so that the main castle was surrounded by lattle castles, that must be first taken by the besiegers before it could be reached.

Among the numerous castles -- there stand about 10,000 in German speaking countries, more thickly in the valleys of the Rhine, Moselle, Nahe and Neckar-- the most important places being taken by the seats of the reigning princes and the imperial palaces. We here only name of the former the Wart burg near Eisenach, founded in the year 1067 by the Thuringian landgrave Ludwig the Springer, and the castle Dankwarderode at Brunswick, built by the Guelph duke Henry the Lion in 1166-1172, and among the imperial palaces the ancient and venerable imperial palace at Goslar, already founded (1002-1024) by Henry II, enlarged in 1065 by Henry III (Fig. 91), as well as the imperial castles at Hagenau, erected and restored by Barbarossa (1152-1190) and his successors, Kaiserslautern, Wimpfen, Nuremberg, Eger and Gelnhausen. The imperial palace at Gelnhausen (about 1180-1200) is especially important to us, since the original impression of its mighty ruins has not been obscured by uncertain restorations, and the former arrangement, which is also repeated in other castles of that time (especially at Münzenberg in Hesse), is still plainly visible. It lies on an island formed by the Kinzig, a right branch of the Main, and

is accessible by a bridge, that leads through the tunnel-like and vaulted two-aisled entrance hall, which opens inward, and from this into the castle court, having about the form of an irregular hexagon. In this stands on the right the massive keep; opposite the entrance are housekeeping buildings against the enclosing wall, on the left lying the palace.(Fig. 92). It was formerly three story and had in the ground story the kitchen, council chamber, and living rooms for male servants. In the middle story, which was entered by a flight of steps and through a portal covered by a trefoil arch, lay the great two story hall, measuring 39.4×42.7 ft., opening into the castle court by coupled arched windows and containing the great fireplace and two other apartments. In the upper story were found the living rooms for the family and the female servants. Over the gateway hall lay the castle chapel, treated in the noble form of the style of the transition period. Of the splendid internal equipment of the palace of the great dynastic castle, the indeed restored but still in truth the ancient singers' hall of the best preserved Romanesque palace on German soil, a representation is given. (Fig. 93).

If we glance over the vast wealth in monuments, that Romanesque secular architecture has left on German soil in the stately ruins of the castles of the former princes and great men, then is also here manifested the unequalled creative power of Germany, that just in the German provinces, where it remained purest, its course of artistic development formed a constantly ascending line, and after a few centuries reached an elevation, at which it created the noblest art works, derived from its most original nature. These great artistic deeds fall in the splendid political period of the German empire, in the days of the Hohenstaufens, in which the German people rose to an unexpected climax, which it never again attained. With the decadence of this noble ruling race it descended from its height. That time, when the curly head of the last Hohenstaufen fell under the axe of the French executioner, indicates the end of the German style and the invasion of the new art style of the later middle ages, born in France.

GOTHIC ARCHITECTURE.

I. General and Historical Basis.

Until about the middle of the 13 th century Germany exercised a supremacy over the Christian peoples of the West. But thenceforth the importance of the German imperial power, which had been perceptibly lessened by the hard and useless contests with the Papacy, constantly diminished. After the campaign, undertaken by the last representative of this splendid race in order to enter into the inheritance of his father beyond the Alps, had ended with such a lamentable termination, there broke over the German lands that "emperorless" and in truth "terrible time", which most deeply shattered the political and economical life of Germany. When orderly conditions later appeared with the restoration of the kingdom, the German empire, by the division into its numerous separate states, could no longer rise to its former greatness. The political centre of gravity of middle Europe was transferred to the West, to France, where the royal house of the Capets, originally sprung from modest conditions, by a wise state policy gradually rose to a position of supremacy, that frequently exercised a determining influence on the history of the nations of the West.

But France not only assumed the role of leader in political respects, but also with reference to intellectual life. Already after the beginning of the 13 th century appeared an unusual intellectual fertility, especially in its northern provinces, that rose in the capital to an elevation full of importance for the entire West. Paris gradually became the most prominent metropolis for the learned and the artists, and according to the testimony of a contemporary writer, a "fountain, that watered the entire earth". There the secular rulers competed with the princes of the church in the fostering of the sciences and the arts, conscious of their aims. German theological students attended the university of Paris to complete their studies there, and likewise for the German stonecutters, Paris formed the most attractive gathering point, that afforded them the most favorable opportunity for their further training. The high advance was however not limited to the capital and the adjacent provinces: all France entered on a period of

bloom about 1200, and upon a general architectural activity, that may worthily stand beside those of the great periods in the history of art.

It was infallible, that just France, where the powerful movement produced in the West by the crusades found its inspired supporters, where the reform movement initiated by the Waldenses and Albigenses took its start, also was earliest affected by the revolutions, that occurred in the 12 th and 13 th centuries in the religious domain and in the entire mode of thought of the western peoples. In unexpected measure had the crusades enlarged the intellectual horizon, a forgetting of the national frontiers, produced a reciprocal approximation and thus aided a certain international feeling, that could not have occurred earlier. This was supported on the one hand by the international orders of monks, who had meanwhile attained to high power, and on the other hand by western knighthood, bound together in common views and endeavors. But all were united by the ecclesiastical bond cast by the church around all Christendom, and the supremacy of the papacy, that reached its highest power about the end of the 12 th century (under Innocent III, 1198-1216), the rule of the successors of Peter over the kings of this world.

Under these circumstances there naturally fell to the clergy, as representatives of the hierarchy, the most influential role in the society of the time. Beside it stood the (secular) knighthood entering on its greatest climax in the 13 th century, and the ecclesiastical knightly orders, who joined together according to monastic laws and rules of life as faithful Christian warriors in the combats with the infidels and for the protection of the church. But to these were added as other important bearers of civilization, the united citizens of the free cities, who attained to great power, sometimes entirely independent of the authority of the state, especially in Germany, the Netherlands and Italy, and in their prosperity blossomed a rich intellectual and artistic life. They soon appeared as owners beside the ecclesiastical and secular founders of churches and monasteries, since they required more spacious churches by the rapid increase of the inhabitants. The common

sense of the citizens tended toward a monumental expression of their prosperity by lofty Houses of God, visible from afar, that should form an indication of the importance, greatness and flourishing condition of their city. But thereby the execution of buildings, that in the Romanesque period was chiefly an affair of the cloister brothers, passed into the hands of secular architects and workmen, in France about 1250, in Germany at latest about 1300. They united in the building lodges, in which were arranged the conditions of working, and the mysteries of high art were taught and learned as in a school. The building lodges chiefly comprised the masons and stonecutters settled about a great cathedral building, but also frequently formed extensive associations, within which occurred a regular transfer frequently of workmen from far separated regions. * Written contracts regulated the obligations of the owners and architects. The works of the journeymen were accounted for by definite marks, given them by the master, and cut in the different dressed blocks, the stonecutter's marks, (Fig. 94), which were also introduced by the masters in their arms and seals. In the cities the masons and stonecutters as well as the other tradesmen also gathered in guilds, to whose thorough training, carried out as in the building lodges, is due the careful execution of art forms. To the master's pride here fostered was it to be attributed, that the artists now appeared in the foreground with their personality and their names, and ensured to themselves a permanent memorial by sculptures of the artist and architectural inscriptions on their works. By the numerous names of artists preserved to us from the late middle ages we recognize the lively interest of the entire people in the masters and their creations.

** On April 25, 1459, there met at Regensburg a great general assembly of the building lodges, at which the union of all stonecutters of German speech in a great general organization was decided upon, with subordinate divisions in the four great precincts of the building lodges at Strasburg, Cologne, Vienna, and Berne, among which Strasburg was decided on as the capital.*

Likewise the second period of mediæval art received its support from religion, even more strongly expressed than in the

Romanesque period; for in an infinitely higher degree the church, by Catholicism, the mind and the entire intellectual life predominated. The mysticism succeeded in its highest development in the Romanesque period, and which was perfected in meditation on the internal communion with God, and the giving up of individual consciousness, finding such an impressive reflection in the harmony of the Romanesque churches, was dissolved by the philosophy of the scholastics, whose endeavors were to prove the teachings of the church as divinely presented, above all individual criticism, and to fix them in a system of formulas. Likewise of this the architecture of the later middle ages gives a vivid reflection. The proper world of representation departed; the entire structural system was developed as derived in rigid sequence from the construction and a formalism carried to the highest clarity, which banned all diversities and excluded all personal caprice.

And yet within this system in architecture and still more in sculpture and painting is perceptible a slight beginning of that refreshing tendency, that was to come to full appearance with the entrance of the following period, the loving observation of nature. Yet also already about the middle of the 13th century very important learned men had made the claim to oppose to the monarchy of the scholastics a science based on experience, and to base this on a thorough observation of nature. But the deeply religious feeling, that dominated that time, was not influenced by them; men were still more believing than before. That unfortunate fervency of belief, which made the crusades possible, produced in the people the depth of emotion, recognizing in entire nature the power of the creator, a true Christian conception of life, as it was preached by the newly founded and influential Order of Franciscans; it was also manifested in church architecture in an even unequalled willingness to make sacrifices, in a boldness, which yielded to no hindrances; it also found for itself an individual artistic expression, in which the idea of a Christianity striving to free itself from the weight of earth and toward heaven indeed appears chiseled in the stone. Thus arose a new, purely theoretically conceived style of art, developed with the m

most acute consistency, that freed itself almost completely from the national character, and entirely proceeded from the Christian religion as the simple basal opinion of the mediaeval world. It therefore became, not the possession of certain professed persons, but the common property of all; therefore its popularity, its deep penetration into the simplest room of the outlying corner.

This art style was actually based on the Romanesque, whose final results in regard to construction it adopted and extended to all members. But while in the Romanesque style we perceive still the echos of the antique spirit, the architecture of the later middle ages is based on principles, that are diametrically opposed to the classical principles of art. The Italian writer on art, Vasari, a contemporary of Michelangelo, whose dominating conception of art entirely after the antique prevented all understanding of its forms, gave it the name of Gothic style, combining therewith the idea of recalling the barbarous and uncivilized Goths, an appellation retained until the present time, however little justification occurs for it.

II. The evolution of Gothic architecture.

The Gothic style sprouted from the soil of France, yet not as essentially a product of the French nation. It appeared first in northern France, just where Romanesque blood was most strongly intermingled with the German of the Celts, Franks and Normans, as a creation of the German intellect, though not exclusively so; it also found its highest development in German lands, while the purely Romanesque peoples inclined toward the antique in their entire art conceptions, and participated in its development in but a small degree.

The Gothic style was already partially prepared for in the Romanesque, the choir aisle, the richly subdivided pier, the system of ribs, the pointed arch in the vaults and the buttress. It matured into a definite system about 1150 in the middle river valley and north of the Seine, in the Isle de France and in Picardy. Here were combined the innovations, which had already resulted in detail for a long time in various countries, into a consistent, harmonious and definite whole. Here appeared earliest the mighty architectural spirit of a new pe-

period, thoroughly permeated by a longing for heaven, which willed the height, slenderness and brightness required by the House of God, in which the dead structural masses were inspired, the souls of the devout should be freed from the weight of earth and be elevated to clearer heights. And therefore this also theoretically and structurally established the highest requirements. By the consideration of the method and manner in which these were solved is also disclosed the understanding of the entire nature of Gothic and a complete view of its course.

The chief attention of the architects must naturally be devoted, first to make the vaults covering the interior as light as possible, then to reduce the supporting walls and architectural members in dimensions as much as possible, and to so arrange that in their dimensions and forms they correspond exactly to the functions falling to them. By the erection of the cross vaults with ribs (page 12) the entire weight of the ceiling was assumed by the ribs. The compartments between them could be treated as thin panels, and indeed be made thinner and thus lighter, the smaller the separate panels and compartments of the vault. Therefore men soon proceeded to increase the ribs by the arrangement of hexapartite vaulted constructions (Fig. 95), or by placing the ribs in the form of stars or of network, whereby originated the so-called star, net and fan vaults. (Figs. 106, 189). The continued increasing of the ribs again reacted on their thickness, when since the load ever became less, they could be made of comparatively lighter sections.

In full dependence upon the subdivision of the vaults, or of the ribs combining at the imposts, are the piers treated. From the round nucleus as a rule project round three-quarter columns (rounds), that exactly correspond in location and cross section to the ribs, the larger ones to the cross and longitudinal arches, the smaller to the diagonal ribs. (Fig. 96). In English buildings the supports of the ribs appear as slender round columns, between base and capital free from the nucleus of the pier, thus becoming "disengaged", but later again united with it.

If the ribs extending from the pier are increased, its subdivision proceeds equally; the rounds are likewise increased, are separated by deep hollows or entirely conceal the nucleus and thus appear as clustered piers, on which the vault ribs in a manner are joined together and rise from the base. (Fig. 152).

On the piers shaped as free supports rests only a vertical pressure, since the side thrust of each separate arch is equilibrated by the opposite one. The combinations of pressures act otherwise in the outer walls at the points on which the ribs meet. Since the counter stress is wanting there, a strong side pressure acting outwards makes itself felt, and when galleries are lacking, this must be met by special construction. On the external walls of the side aisles and of hall churches, this was obtained in the simplest manner by the construction of buttresses, which received the thrust of the vaults. (Fig. 100).

More difficult is the problem for the clearstory walls of the middle aisle rising above the side aisles. No buttresses can be arranged for these, since to extend them down through the roof of the side aisle to the internal floor, or rather their construction from thence, would have injured the entire effect of the interior in the worst manner. Therefore men came to the fruitful idea of receiving the pressure of the vaults on the clearstory walls by a free arch and of transmitting it to the extended buttress of the side aisle. (Fig. 87). With the adoption of these flying buttresses (buttress arches) the Gothic style reached its full maturity. Aside from the abbey churches at S. Germer (page 47) and S. Denis (1137-1144), where the original buttressing is no longer recognizable with entire certainty on account of later changes, these are to be found in their original condition on the cathedral of Noyon (completed 1167) and of the abbey church at Dommartin near Châlons (1153-1163). In this buttress construction, which was originally only executed in ashlar without ornamentation, the construction appears in entire nudity. The external appearance of the cathedrals was sacrificed in order to secure the most advantageous treatment of the interior.

The introduction of the buttress system coincided in the br-

broadest sense with the Gothic structural principle requiring the reduction of the masses. Since the entire load of the vaults was received by the buttresses and flying buttresses, the walls lying between these merely had to support their own weight. The opening of the walls in favor of the arrangement of colossal windows was no longer opposed by any statical reason. The cross sections of the buttresses may then be reduced upwards in the same proportion as the pressure to be supported by them is lessened. As in them, there is also made in the other structural parts from below upwards a continued change from heavy to light.

The entire architecture obeyed the general desire for height; this is indicated by the pointed arch already prevailing for all vaults and openings, as well as the strong emphasizing of vertical lines produced by the buttresses and the entire subordination of horizontal lines. The structure therefore ever became more slender; all proportions were elongated, and all architectural members were finally reduced to just the dimensions necessary for their purpose, until finally the entire building appeared as a skeleton-like structural framework, on which the masses diminish upwards. (Figs. 98; 158). In the combination and the resulting alternation of the entire effect of pointed arches, cross ribs and buttress construction thus lies the nature of Gothic.

79 This matured state was already attained at the middle of the 12th century in the vicinity of Paris and in the French provinces lying further north. From thence the new style extended under the active fostering of the influential Cistercian Order, particularly inclined toward the strict Gothic structural principles, over all France, through the Norman-English possessions to the British kingdom, over Germany, Italy and Spain. Even if in various lands and places the existing architectural traditions reacted, if the requirements of the Orders were effective in other ways, and the school training and traditions in the different building lodges and even in the families of stonecutters led to various peculiarities, yet the Gothic style still retained its international character.

In its evolution may be distinguished three periods in general, that characterize the development, climax and decadence

of the style, the early, high, and late Gothic. Yet a corresponding limitation in time can only be made with regard to the different countries. For at the end of the 12 th century, France had already passed through its early Gothic, when this first set in throughout the greater extent of England; but in Germany the earliest works of the Gothic style originated in the second quarter of the 13 th century, and it first generally appeared at about 1250. Therefore we shall fully describe the periods to be considered in regard to the various countries with the monuments concerned, and the characteristic style changes in the Chapters on the architectural treatment and the decorative equipment. (Pages 82 and 97).

A. Gothic Church Architecture.

The Ground Plan.

The Gothic transformed the ground plan in a far less degree than the superstructure. The mode of worship remained the same, and the time had set no different requirements in regard to the rooms, nor their grouping. Only for the choir was required, particularly in the great cathedrals, the principal churches in the residence city of the bishop, in view of the increase in the clergy and their participation in the ecclesiastical ceremonies, a greater extent and richer treatment, and with reference to the relics obtained by the crusades and the increasing veneration of saints, an increased number of chapels for the establishment of altars for saints and reliquaries. In order to make the sacred bones generally accessible for veneration, they were now generally placed in the altar table, enlarged for this purpose. The crypt was therefore regularly omitted.

But otherwise all types of plan had already been produced in the Romanesque period. The further development substantially concerned innovations, that resulted from the acquisitions of Gothic treatment of vaults. These first of all consisted in the complete freedom from the restricted Romanesque system by the introduction of continuous bays (of equal length), thus being an equal number of bays of vaults in the middle and side aisles (by placing the rectangular bays across the middle and lengthwise the side aisles; see page 4 and ground plan in Fig.

6), and still further in the polygonal choir endings produced by the ribbed vaults and the construction of buttresses. The nave system, introduced with the Early Christian basilica into Christian civilization and developed in the Romanesque period, always characterized the expressed ground form of the Gothic church, in which it was brought to the highest possible perfection everywhere. According to the kind of choir or nave plan, four main groups may be made in this system; the so-called Gothic cathedral ground plan with choir aisle and circle of chapels, the earlier basilican scheme with simpler form of choir, plans with two aisles, and those with a single aisle.

The most developed form is represented by the so-called Gothic cathedral ground plan with choir aisle and circle of chapels. (Fig. 99). It consists of a three, five or even seven aisled nave, transepts one or three aisled and projecting but little beyond the line of the nave, and a choir lying on the prolongation of the middle aisle and ending in a regular polygon, around which the inner or all side aisles were carried as choir aisles, and which ended externally with a radially arranged circle of chapels. (Fig. 153). The transverse aisle was frequently omitted. The chapels also sometimes extend along the nave walls to the western facade. On this two massive towers rise over the entrances to the side aisles. (Fig. 131). Between them lies the grandly designed main portal. This ground plan is chiefly found in cathedrals, but is occasionally met with in monastery and sometimes even in parish churches.

The churches firmly adhering to the older basilican scheme are somewhat inferior to the great cathedrals. They differ in ground plan from them chiefly only by the choir plan. For the nave is retained as in those. But the eastern part ends with a polygonal apse for each aisle, that no longer has the character of a niche, but appears a continuation of the interior of the aisle, with the same width and height. This adherence to the simpler plan is connected on the one hand with endeavors for simplification in the high Gothic, and still more prominent in the late Gothic, that were favored by the reform movements of the Franciscans and the Dominicans. These beheld pure Christianity in the return to poverty, and in the teaching of-

office typified by Christ's Sermon on the Mount, thus in preaching, the chief part of the divine service. On the other hand the citizens, who were in direct sympathy with this Order enjoying great popularity, demanded greater attention to the lay element in the plans of city churches. Thus the choir lost in importance; sometimes it was entirely omitted. Since a single room proved best adapted for preaching, men decided to prefer the hall church scheme (Fig. 100), also moved the buttresses toward the interior and placed galleries between them in order to obtain more space for the auditors. With greater requirements for space, men not seldom passed in late Gothic to five aisled hall churches.

The endeavor of the preaching Orders mentioned to not exceed the requirements for space also led to the erection of two aisled churches. These consist either of a main and one low side aisle in the form of a basilica developed on but one side, or then assume the more common form of a hall church with a middle row of supports and a choir lying on its axis, if not as more rarely the case, doubled choirs are arranged beside each other, in order to not conceal the view of the altar by the row of piers. In the simplest form of this type, to which belong numerous churches, especially those erected by the Franciscans and Dominicans in Germany and Austria, with but a single support in the middle of a square principal room. Also exceptionally occurs an extension of this system to a four aisled hall church with two symmetrical choirs. (Church at Schwarz in the Tyrol).

Plans with a single aisle form the rule in the smaller city and country churches, but in France, where the hall church enjoyed great favor already in the Romanesque period, as well as in Spain, Italy and England, even came into use for great cathedral buildings. In them the unified effect of the undivided interior is grand.

Although on the great cathedrals with choir aisle and circle of chapels the eastern part appears to be one half a central plan, entirely central buildings are a rarity in the Gothic period. These were indeed introduced very early in the Gothic (in the Liebfrauen church at Treves, built 1227-1250), but th-

they could acquire no school-forming importance, at least in church architecture, and they but exceptionally found acceptance in certain chapels in Germany, Portugal, England and in English chapter houses. The ground plan then follows the Greek cross with a circle of chapels extending around it (Liebfrauen church at Treves), or the polygonal structure with a low outer aisle or star-shaped radiating chapels, or also the polygon with central pier and annular vaulting. These central buildings afforded excellent opportunities for the rich development of the star, net and fan vaults. (See page 86).

II. The building and its architectural treatment.

The Gothic middle ages created Houses of God of such vast extent and extreme height, that the owners and masters, who devised and commenced them with their direct successors could never entertain the hope of seeing them in their completion, that rather their execution required the greatest endeavors of several generations, and to many buildings fell the lot to remain unfinished. And this did not refer to such masses of buildings, as were erected in the Romanesque period, but always to a well conceived, carefully constructed organism, on which each separate architectural member was set in alternating relation to all the others, or was deduced from them with the most acute consistency. Therefore an accurate laying out of the plan was necessary, and this required a knowledge of architectural construction far excelling an acquaintance with the practical procedures in everyday use, and a deep insight into the static conditions of buildings. It is just the high technical undertakings of the chief masters of Gothic cathedrals, that fill us with surprised amazement today, in our so advanced age in regard to expedients, in view of these colossal structures raised to such a dizzy height.

Thus the technical procedures commenced with the designing of the plan. Various examples of these have been preserved. (Of Cologne, Strasburg, Ulm, Vienne etc.). They exhibit by the numerous sketches of elevations on the plane of the ground plan such a dense complexity of lines, that only masters versed in the mode of representation could understand them. In scientific expedients, quadrature and triangulation, geometry and arithmetic, the golden section, and definite numerical propor.

proportions occupy an important place. Particularly in the dimensions and construction of Gothic churches the equilateral triangle appears to play the same part as the square in the Romanesque buildings. Statical calculations in the sense usual in modern technics were not made. Men depended upon definite experimental principles, that formed a chief part of the technical instruction in the building lodges, and these were strictly kept secret from non-members. They were transferred by oral traditions to the younger generation in the building lodges and the families of the stonecutters, but later with the extension of printing were also partly fixed in book form, and thus have been occasionally preserved to our time. From these manuscripts and the artistic representations mediaeval building construction proceeded, so that the scaffolding of the structures, the obtaining of the material, the use of the tread wheel for hoisting and setting stones, certain general and everywhere remaining methods and customs were developed, that are also in part in use today.

Since ashlar construction permitted the highest artistic treatment, men preferred as materials the native cut stone in the different regions. The procuring of this often caused great difficulties and disproportionately high cost, while the wages of labor were very low. This explains the extreme utilization of the material and the expense, that the generally careful dressing of each separate stone required. Where men were restricted to bricks, as for example in the north German lowlands, they must limit themselves to great simplicity of the system and of the detail forms. Yet they understood how to produce splendid effects by the happy use of the motives of the blind arcade, favorable to masonry construction, by the graceful mouldings of the enclosures of the windows, by brick friezes, netted, lattice-like and frequently recalling Norman-Arab ornamental patterns, and by varied treatment of the gables.

We have already described the structure in its main lines. While we now take it up more fully in regard to its details, we shall consider the architectural treatment compelled by it in a far greater degree than in any other form of art. With

the introduction of the continuous bay (page 80) occurs a uniform loading of the internal piers. The prevailing alternation of heavier and lighter piers in the restricted Romanesque system, according to whether they stood at the angles of the squares of the middle aisle or between them, consequently (with few exceptions) gave way to an entirely uniform treatment of all piers. Their subdivision was limited in the early period to a circular nucleus with four or eight slender columns (Figs., 96, 101), but then with the richer treatment of the vaults passes to the clustered pier with deep hollows between the rounds, but again simplified in late Gothic by a round or octagonal form of the shaft with very slender proportions, in order to obstruct the view of the preacher as little as possible. Sometimes capricious works are attempted, for example spirally rising thin rounds about the circular nucleus (Fig. 163). The pier stands on a polygonal or square base, beveled at the angles, that stops at top in hollows between the supports of the rounds. A very low and plate-like base, still recalling the sequence of members in the Attic type, whose mouldings also extend around the nucleus, forms the transition to the shaft of the pier. (Figs. 101, 152).

The columns extending on the pier as rounds here have a slender and often very thin shaft, as a rule smooth and not diminished, as well also as when employed as free supports. The capital mostly loses its original meaning as an architectural member receiving the load horizontally and transmitting it to the shaft; it rather appears as a strengthening and interrupting of the shaft caused by decorative reasons, and therefore in the late Gothic with its aim of simplification, it is not rarely quite omitted. Its basal form is that of the bell, and so long as the abacus had not assumed the polygonal form, projected beyond that. At first the conventionalized bud capital of the late Romanesque period remained in use. (Fig. 102). But at the same time was adopted the new and specific Gothic form of capital and (in Germany about from the middle of the 13th century onward), it predominated generally. The bell form is covered with quite naturally treated foliage from the native flora, particularly with oak, maple, holly, ivy, vine, rose,

thistle and clover leaves, that partly grow out of the astragal or appear to be loosely attached. To produce a more tasteful effect when viewed from below and a better harmony with the deep shadows of the architectural members, the foliage received pattern-like forms and an ever progressing conventionalization by swelling out the leaves with strong accenting of the leaf ribs extending over the swells. In the best period may always be recognized the natural forms. But in the late Gothic originates that knobby, deeply undercut and withered foliage, which occasionally occurs in combination with entirely natural scattered or clustered blossoms and fruits, but otherwise all recollection of natural forms has vanished. (Fig. 103). By the arrangement together of the capitals belonging to the separate rounds on the clustered pier and the carrying of the mouldings and ornamental work around the nucleus, this received a graceful capital course as its upper termination. (Fig. 101).

The ribs rising from the piers retain in the early period the rounds in the hollowed angles, but replace them in high Gothic by pointed rounds with pear-shaped sections. The profile of the pointed round at first has approximately the form of a circle with an attached fillet, but continually extends in depth, until at last (in the second half of the 15th century) it contracts into a rectangular member with shallow hollows in each side. (Fig. 104). In the latest period to the ribs is frequently given the appearance of knotty branches or other peculiar forms. The junction of the diagonal ribs at the apex of the vault is effected by the boss (keystone), instead of which an open stone ring frequently occurs. The boss is often richly ornamented by foliage, arms with inscriptions and figure sculptures. (Fig. 105). The English late Gothic exhibits as a peculiarity long keystone pendants, held by supporting iron rods, which sometimes are hung to two strong diagonal arches spanning the vault. (Fig. 140).

With the richer development of the system of ribs the construction of the vaults also changes. In the hexapartite cross vaults already occurring in certain Romanesque buildings of northern France (Fig. 95), there is added to the two diagonal

arches a third arch set crosswise and passing through the apex, which was therefore particularly suitable for the Romanesque system, since the two smaller side arches lying in the arcade walls corresponded to the squares of the side aisles. But the Gothic period soon passed over to star vaults. (Fig. 106 a). This original form of cross vault by the frequent subdivision of the compartments by ribs, which represent the star form in the horizontal projection. Frequently instead of the cross vault occurs a domical vault in hemispherical form and passing through the angles of the vault bay, upon whose surface may then be projected the ribs from the figure on the ground plan. Then the subdivision of long interiors into separate bays can still be retained. But the transverse arches are almost always included in the figure and thus lose their original importance, receiving the same size and mouldings as the other ribs. Later the division of the vault into bays was entirely omitted; the transverse arches disappear or seem unimportant portions of a network of ribs uniformly stretched over the entire interior. For these netted vaults the surface of the vault forms a tunnel vault intersected by small pointed vaults at the longer sides. The network of ribs is then first drawn on the ground plan in straight lines, afterwards being projected on the surfaces of the tunnel vault. But the late Gothic with the high development of technics and the purpose of undertaking show pieces also at last abandoned the straight lines and replaced them by curves. In this manner were obtained the ribbed vaults with doubly curved ribs, soon such favorites. (Figs. 107, 161). Very frequently in the late period resulted the connection of the ribs, so that they crossed at the intersections and were cut off on the other side. If the ribs rising from a free support (pier or column) were very much increased in number, so as to be grouped in form of an opened fan, then originated the fan vault. (Fig. 169). This found a preferred use in the English chapter houses and in the buildings of the Teutonic Order of knights (Marienburg). In all these vaults the compartments were originally constructed with less and later with more swelling between the ribs (see pages 12 and Fig. 12). The netted vaults finally received an innovation in that the divi-

divisions of the network on the ground plan remained straight lines, but the compartments were replaced by high cloister vaults (volume 1, page 106) or pyramidal raised cells, indeed almost with the omission of the ribs. These cell vaults make a stalactite impression, especially for network with small meshes. (Volume 1, page 209). They occur almost entirely in the late Gothic of the Saxon provinces (among others in the Albrechtsburg in Meissen and in S. Peter in Brandenburg).

With the enrichment of the forms of vaults chiefly with the purpose of decorative effect, the thought returns to the consistent development of the construction. The execution of slender wall columns is no longer an indispensable requirement. They were shortened, thus beginning at a small distance below the imposts of the vaults on corbels, or were entirely omitted. The ribs then rest on corbels at the wall sides (Fig. 108). Finally they directly pass into the wall surfaces or the round or polygonal piers without any transition member. (Fig. 161).

Of the walls, in consequence of the great wall openings in hall churches, there only remained surface bands lying below the windows, with similar ones in the clearstory of the middle aisle of a basilican church. But also this part of the wall surfaces was then divided into the triforium (see page 20 and Fig. 109). The middle aisle therefore appears in four stories in the early period, so long as galleries were inserted; but later in the best period it became only three story with the omission of the galleries.

A particular development into perfected beauty was received by the windows. They chiefly lie in the middle of the wall with a strong splay downward, inside and outside. The jambs were subdivided in the richer treatment into alternating rounds or pointed rounds and hollows; they were always covered by a pointed arch in the early and best periods. In the clear surface the last remnant of the wall opened in the triforium disappeared in a stone tracery with the highest charm. The lower portion of the window forming a rectangle is subdivided by numerous mullions rising vertically from the sill, and in tympanum of the pointed arch this passes into the tracery (Fig. 110), the perforated stone slabs exclusively designed

with compasses and ruler, which artistically correct the mullions. The drawings are chiefly composed of pointed arches, circles and trefoils or quatrefoils, in which by tangential cusps projecting inward, are again fitted smaller and opposite trefoil or quatrefoil circles. (Fig. 111). According to the number of the latter are these figures termed trefoil, quatrefoil or polyfoil. In the second half of the 14th century the tracery was enriched by a peculiar recurved and elongated two-sided figure with two cusps, which recalls the fish's air bladder and has also received its name. (Fig. 112). The late Gothic makes the most extended use of this new motive. By inscribing the fish bladder within the circle arises the three, four and polypanel. (Fig. 113). If there are three or more mullions, these often alternate in size (old and young mullions), and likewise in the tracery are found corresponding main figures, within which are arranged the smaller ones. The mullions and the corresponding tracery ribs always have the same section, a projecting round in the early and the first part of the best periods, which as a slender column against the mullion is furnished with base and capital. (Fig. 111). Later the rectangular bar with hollows on each side became generally common. Extremely richly was developed the tracery of the wheel or rose windows. They are native in France and there belong to the most splendid parts of the cathedrals, on which they find a place on the most prominent part of the facade over the main portal. In Germany and England as a rule, a pointed window with many divisions is arranged instead of them. (Figs. 131, 98, 142). The famous rose window of the minster at Strasburg follows French influences; it has a diameter of 45.9 ft.

The main portal is treated with great magnificence. As in the Romanesque period, the jambs are strongly splayed and are similarly formed, for little columns or rounds (later pointed rounds) alternate with hollows. The entrance opening is often divided by a middle post but retains the rectangular form. The pointed tympanum thus produced is intended for the reception of representations in relief. Likewise in the richer development are statues inserted in the hollows of the jambs, each one of which is covered by a canopy, which at the same time

serves as a corbel for the figure above it. Thus they form a continuous series, that ends above at the vertex of the pointed arch. (Fig. 114). Directly above the outer angles of the pointed archivolt generally rises a steep ornamental gable adorned with tracery (tracery gable), by which the portal is particularly accented. In the richer treatment the tracery gables are also found over the windows. (Fig. 115). The great cathedrals generally have two other and similarly treated side portals on the axis of the transverse aisle.

In the external architecture the buttresses are first apparent. They seem like strong supporting walls projecting from the face at those points where the bays of the vaults meet and the ribs unite in the interior. Corresponding to the pressure diminishing upwards they are offsetted several times, furnished with shed-like covering slabs at the offsets and covered at top by a gable. At first entirely constructed of ashlar without ornament (Fig. 100), in the best and late periods, especially in moderate forms, they were ornamentally treated with mouldings, blind tracery and niches for statues. (Fig. 116). When receiving flying buttresses and in order to increase the resistance to side thrust by loading at top, they mostly receive an extension like a pier, at first covered by gable slabs, but later terminating in a steep square pyramid with the form of a small tower spire. (Fig. 116). Thus is derived from structural ideas an architectural member, indeed occasionally appearing already in late Romanesque and Byzantine art, but new in this application and very characteristic of Gothic, the finial as a little ornamental tower, consisting of the slender rectangular "body", frequently opened to receive a statue and covered on all four sides, and the "finial" rising like an obelisk ("risen" from English to rise). These finials crown the buttress and the junction of the flying buttress with the wall, flank tracery gables, and at last also find a purely ornamental use as an aspiring and resolving motive, particularly on the offsets of the buttresses and gables, sometimes even on the oblique slopes of the latter. The flying buttresses at first have the simple structural form made of ashlar, but are later splendidly decorated by mouldings and tracery. For five

aisled plans they are mostly supported or interrupted by intermediate piers, placed above the internal free supports of the side aisles.

Aside from the tracery gables soon (in France after the middle of the 13 th century) generally employed above the windows, the external wall surface lying between the buttresses received only on very rich buildings, and then almost entirely on the main facade, a further subdivision by triforiums and blind galleries with mouldings and tracery, that either appears overlaid or free before the surface of the wall. The latter mode of treatment has a prototype in the Romanesque art of Tuscany. (Page 51). Transformed into Gothic moulded and tracery decoration, it is particularly favored for the resolution of large surfaces of gables. A particularly rich ornamentation was received by some great church-buildings in France and England, (Notre Dame in Paris, cathedrals of Rheims, Amieys and Litchfield), when on them is inserted beneath the story with the rose window a continuous gallery containing statues, the gallery of kings. (Figs. 128, 144).

82 The subdivision by horizontal members is almost entirely limited to the low and but slightly projecting band above the plinth, the band below the windows, and the main cornice bordering the base of the roof. For the profiling of all cornices of bands is characteristic the beveled projection under half a right angle with a half round attached to the wall, a deeply cut hollow and the water drip, i.e., the upper surface steeply sloping outwards (Figs. 117, 118). In the best period the main cornice was preferably enriched by a foliage frieze. Above it and along the roof gutter (in France after the the second quarter of the 13 th century) extends the balustrade, frequently ornamented by the addition of figure sculptures. Fig. 118). The English buildings and those of the north German brick Gothic are crowned by a row of battlements instead. (See Fig. 147).

The roofs rise steeply and high above the main cornice or behind the balustrade or battlements. Over the middle aisle the form of the gable roof continues in use, which terminates over the choir in a hip roof corresponding to the polygon of the great plan. The shed roof no longer appeared suitable for

side aisles. It was replaced by transverse gable roofs erected over the separate bays, and in view of the better removal of rainwater and snow not infrequently passed into the flat terrace roof. (Fig. 166). Also on hall churches men generally sought to avoid the difficulties resulting from the covering of the entire bay by a single lofty gable roof and its heavy appearance by the arrangement of transverse gable roofs over the separate bays with hip roofs or gables along the sides. In north Germany and Holland there is found even lengthwise a gable roof over each separate aisle. The greatest attention was paid to the removal of rain water. It was collected in carefully cemented stone gutters, led down the tops of the flying buttresses over the side aisles and cast far from the walls by the gargoyles, shaped as distorted and fanciful human and animal figures. (Fig. 119).

The exteriors of Gothic churches on both sides and the choir only appear as an architectural covering and decorative treatment of a building skeleton, developed for pure construction, so that it rises in the facades and the architecture of the towers to an extremely monumental treatment, uniting the whole in a grand general representation. The number of towers is less than that of Romanesque church architecture. (The cathedral of Noyon, completed 1167, still has four towers at the angles of the western facade and between choir and transepts, and that of Laon of 1174-1226 exhibits -- perhaps with regard to their effect on the finely located and elevated square -- even seven towers in one group, which is a prototype for the German cathedral at Limburg-a-L. (Fig. 9). Most Gothic cathedrals are limited to two massive western towers or even a single tower erected over the main portal on the longitudinal axis, and a small wooden roof turret above the crossing.

On the main towers may generally be distinguished an elevation divided into three parts; the substructure extending in several stories above the roof or the ridge of the middle aisle, the bell story opening with great sound windows, and the spire rising above this in the form of a steep octagonal pyramid. They all have a square base, have massive and frequently stepped buttresses at the angles, which finally terminate in

canopy structures or finials, behind which the basal form of the upper part of the tower changes into an octagon. The spire was originally built with a solid wall (Fig. 120), then being constructed of slabs with slot windows or with openings in the form of open foils. (Page 88). Finally it was entirely resolved into open tracery. (Figs. 98, 158). At the edges of the tower pyramid adhere crockets or angle flowers, that seem to travel toward the vertex and thus complete the restless upward movement. The oblique edges of the gables, tracery gables, finials, and generally also the flying buttresses and buttresses are beset by these crockets. At first they have the form of opening buds with knobby enclosure (first on the cathedral in Laon), but then follow all style changes of Gothic foliage ornamentation. The topmost crowning ornament of the tracery gables, finials and towers is always formed by the cross-flower, that consists of four crockets grouped around the apex of the spire, frequently arranged in two or several rows above each other. (Figs. 121 a, 121 b, 122). Thus the exterior of the Gothic cathedral, like the interior, appears as a highly individual architectural creation, in which the resolution of the masses is carried to the extremest limit of possibility, and in which a powerfully expressed life pulsates in all the members.

In the stage attained by the climax of the Gothic style, this represented itself as an organism without gaps, as a system matured in the least details. Hence it was also capable of no further fruitful development. The forms gradually withered. Already in the second half of the 13 th century occurred (in France) the first indication of the downward development of the style in appearance by the strong emphasizing of unimportant things, an inclination toward the picturesque and endeavors for freedom from the law restricted to mathematical consistency.

With the 14 th century then appeared (in France) the expressed late Gothic. The choir lost its importance. It was preferred to omit the transverse aisle. In the structure the type of the hall church won preeminence. In stead of the clustered pier occurred piers with octagonal or round cross sections.

Where they were retained, the rounds pass directly into the ribs without capitals. The construction and subdivision are refined; they permit the recognition of an animated and really mechanical enjoyment in technical show pieces and novel decorative treatment. (Fig. 123). In the ceilings the net vault became the rule, and which soon passed into the double curved ribs. (Figs. 107, 161). Not rarely the network of ribs received a treatment like tracery of the windows, but it also sometimes degenerated entirely into knotty branched work. The resolution of the masses of the walls no longer had the force of the supreme grand principle; with the small openings in the walls appeared the inclination to form larger surfaces. The pointed arch no longer remains in unlimited control; it is re-curved in the ogee arch, so characteristic for the late Gothic, (A in Fig. 124), which completely dominates the forms of the tracery gable, of the crownings of canopies, and the like. B. Beside it the (circular) round arch again comes into use, the straight shouldered arch (B) on doorways, and on windows and doorways the depressed (elliptical) round arch (C), the low segmental arch (D), and the inverted (curtain) arches (E' and E''), chiefly native in Saxony. For the French late Gothic is the round-cornered (eared) arch (F' and F'') characteristic, and for the English a depressed form of the pointed arch, the Tudor arch. (E). In the tracery occurs the fish bladder in infinite variations. On the jambs of the portals beside the pointed rounds are again found small rounds that intersect at top like lattices. (Fig. 125). The entire mouldings also participate in these intersections. The rounds stand on small cylindrical bases, that are decorated by all sorts of tracery, network and interlacings, or by spirally twisted flutes. Frequently stand before the portals independent porches with the richest ornamental and sculptured decoration. (Fig. 150). In the external architecture the representation of the slender and elongated is finally carried too far and the structural principle is suppressed. The ornamental members, crockets, cross-flowers and the like become stiff and appear as if withered. The finials ever become thinner and at last recall metal works. Generally only a single tower rises above the port-

portal of the western facade to a previously unattained height. The entire technical and decorative treatment exhibits an ever progressive independence from the formerly strict laws of art, a constantly advancing freedom in the entire treatment of form. It clearly shows us, that the late Gothic is already breathed upon by the new spirit, foreign to the middle ages, that leads to humanism and the Renaissance.

III. The Decorative Equipment.

Besides the ornamental forms depending on a geometrical basis and directly resulting from the architectural treatment, the tracery, the pure ornament developed in plant and figure motives plays only a modest part. The wealth of Romanesque art in frieze decorations and conventionalized interlacings of plants with interwoven figures no longer continues in the Gothic. In it the common enjoyment of nature leads to an important innovation, particularly to the adoption of quite naturally treated foliage in the artistic expression of forms. Not only on capitals but also on cornices, the jambs, of portals, in vacant tympanums and in enclosed panels of surfaces, this foliage and plant ornament found admission. Among the motives chosen for imitation, those representing the shoots and buds of the plant kingdom enjoyed greater favor than their developed forms. Frequently the approximation to the natural impression was even enhanced by painting. The entire early period of Gothic is dominated by this purely naturally conceived plant ornament. In the best period and gradually introduced by the pattern-like repetition of the architectural forms once obtained and with the endeavor for monumental treatment, the already described (page 85) conventionalization, in the course of which the recollection of the model, once taken from nature directly, almost entirely disappears. (Fig. 126). Only the last phase of the late Gothic on the portals and the frames of panels again employs knobby branches, that appear like a direct imitation of knotty natural woods. The execution of the ornament, the acute estimate of the effect from below, the judging of the proportions of the dimensions according to the purpose, the location, and particularly the progressive enlargement of the details with their increasing height, deserves our

highest astonishment.

Besides the ornamental work, sculpture took an active part in the decoration of Gothic churches. By the carving of gargoyles and the figures on balustrades and keystones (bosses), it solved a chiefly ornamental problem. But it rose to a higher conception, and in the statues, with which the portals, the galleries of statues (kings) and the finials treated as shrines. The compression of statues into the narrow hollows led to too greatly elongated proportions of the bodies. From the endeavor to free itself from these restricting references to the architecture may be explained indeed the flexure sidewise peculiar to the Gothic figures. What is wanting to them in personal beauty in comparison to the antique works of sculpture or ⁹⁸is lost by the native costume, is frequently replaced by the expressive thought in the faces, that very fully manifests the feeling of the time as inclined toward sentimentality. In the interiors of churches the art of sculpture was chiefly abundantly occupied with the pulpits, rood screens, altars, and the tabernacles alone belonging to the Gothic period (Fig. 127), in their richer treatment. On them is strikingly shown, how the series of forms developed in architecture was directly transferred to the minor arts. The artistic certainty and the charming treatment of all details, that frequently distinguish their works in even the smallest village churches, manifest so justly the loving faith and self-denying piety of the high middle ages.

The Gothic did not favorably affect painting. Indeed it did not entirely reject colored ornament, since already it so expressively painted the columns, capitals, ribs and bosses with varied colors in order to enhance their effect. But for the larger comparisons, for fresco painting, there no longer remained any extended surfaces, at least in northern art. For the wall surfaces between the piers had been almost entirely resolved by the window openings and the trifuriums, and the vault compartments were mostly unsuited for painted representations on account of their height. But so much the more grandly was developed a special branch of this art, the glass painting. Already in the Romanesque period occurred windows with representations of figures; but the Gothic brought it to its climax.

Its technics substantially consisted in the composition of figures with variously colored sheets of glass, cut out according to the drawing and set in leads. They were certainly limited originally to the production of mosaic patterns with cast glass of different colors (after the example of opus sectile; see volume 1, page 113). * Then men proceeded to produce figures by the same method of treatment, when the lines and shadings lying between the lead outlines were applied in strokes with a fusible brownish-black color. According to German documents glass windows with representations of figures already existed about 800 (in the old Benedictine church at Werden-o-Ruhr). The oldest now existing date from the second half of the 11 th century (windows in nave of cathedral of Augsburg). The colors consist of red, blue, green and dark yellow. In the 14 th century was added thereto the bright "silver yellow". At the same time changes in the style made themselves apparent. Men endeavored to model the bodies of figures; the figures received the Gothic flexure. They passed to important technical innovations at the beginning of the 15 th century. They had become acquainted with various fusible colors. Colorless glass sheets were coated these, they were burned in, producing the "uberfang" glass by grinding off in some places and then applying other colors, obtaining an extremely splendid and effective lighting and shading. In the Romanesque and early Gothic periods the paintings proper were enclosed in a round frame and thus inserted in a window, otherwise treated with carpet patterns. The best and late periods of Gothic enclosed them in a canopy architecture, that chiefly covered the entire window. By the splendor of the colors, the technical treatment and the entire purport of the representations, which took their materials, first from the Bible and the legends of the saints, then from history, but also finally included the persons and families of the founders, the Gothic period created unusually interesting works in these glass windows, with high value in art and also in the history of civilization.

** From the inspired writings of the early mediaeval authors we know, that in middle and southern France already in the 5 th, 6 th and 7 th centuries, the churches were adorned by variously colored windows of glass mosaics.*

The great Gothic cathedrals were frequently in architecture and decoration fail in the entire unity of the style. As a rule their erection required such long building periods, that the different phases of the style, in the course of its evolution from the early Gothic to the best period and the late Gothic, can be very clearly followed according to the progress of the works from east to west and from below upwards. Certain principal structures were already commenced in the Romanesque period; others received their completion only in the latest time. Their arrangement in the different periods therefore can only follow with corresponding reservations.

IV. Spread into the different countries and the Monuments.

I. France.

The three periods of the Gothic style are designated as primary, secondary and tertiary in France, the land of its origin. If we here adhere to our former appellations and follow the general course of its evolution on French soil, then is to be assigned to the early Gothic the second half of the 12th century, and to the best period the 13th century. Late Gothic falls in the 14th and 15th centuries and disappears only after the first third of the 16th century. In general the Gothic style in France develops no substantially individual and national course; it appears more as an intellectual contemporary style, whose course we have already considered.

In the early Gothic (from 1150-1200) the earnest and heavy forms of Romanesque art still have great influence. The clear-story walls rest on round piers, from whose antique-like capitals rise the rounds. The ribs of the generally hexapartite cross vaults have the form of large rounds. (Fig. 106). In the windows usually remain round arches, and where the pointed arch appears in their place, the ornamental filling with mullions and tracery is omitted. In the ground plan the single or double choir aisle is the rule, either with a closely arranged series of chapels, or with entire or partial omission of these. The transepts frequently end in apses, so that the eastern end is treated in trefoil or triapsal plan. In the structure were still retained the galleries for structural reasons, but they disappeared with the gradual development of the buttress system.

The first great architectural work, that unites in itself a

all the basal traits of the Gothic style is the abbey church of S. Denis near Paris, whose choir and western facade, abbot Suger, the famous ecclesiastical prince, statesman and learned man, caused to be erected between 1137 and 1144. It has a double choir aisle and a circle of chapels with two facade towers, whose construction with buttresses, in great part still in Romanesque forms, permits the recognition of a new structural system. The model here given was directly followed by the cathedrals of Noyon, completed about 1167 (pages 77, 93), Laon (1174-1226) with three aisled nave and transepts and seven towers (page 93), and of Notre Dame at Paris (1163-1235). All still have in ground plan two squares of the side aisles to one bay of the middle aisle, and in the structure are galleries, triforiums and clearstories, so that they appear in four stories in the middle aisle. The western facade with two towers at Notre Dame (Fig. 128) has become typical for most French cathedrals. By bold horizontal belts and the insertion of the so-called gallery of the kings, containing the kings of Israel, beneath the story with the rose window and by a high triforium above this, the horizontal subdivision is strongly emphasized. It is retained as a peculiarity of French Gothic, although not corresponding to its principles. Perhaps in this is to be seen one of the reasons, why most French cathedrals have undeveloped towers, for the spire is wanting to them. On the cathedral of Chartres, begun in 1130, only the two towers, between which lies the triple portal leading to the middle aisle, belong to the early Gothic building. The cathedral at Sens, (begun 1152), in which clustered piers alternate with pairs of slender columns, omits the galleries, and likewise the cathedral of Soissons (1175-1212), in which the bays are continuous as an important innovation for the further development of the Gothic system.

The best period (1200-1300) brings during the reign of S. L. Louis (1226-1270) the classic age of French mediaeval art. All France was seized by a marvelous desire to build, that finds few parallels in the entire history of the world in the art, and which executed works on grand plans in the highest perfection. The prevailing system in the ground plan is composed of

two facade towers, a three aisled nave and transepts, a five aisled choir with single ambulatory and radially arranged polygonal chapels (as in the choir of the cathedral at Cologne, Fig. 153), with continuous bays. The galleries are constantly omitted. The upper wall below the clearstory is resolved into triforium. In the tracery, particularly that of the rose windows, the radiating figures are characteristic, from which the architectural style of the period has received the name of radiating style (*style rayonnant*).

In northern France among the great number of important works, there stand at the head the cathedral of Chartres, rebuilt after the fire of the year 1194, excepting the two western towers, completed in 1260, ~~that at Rheims~~ Rheims (begun 1212, Fig. 97) with famous facade, whose erecting commenced in 1251, the cathedral of Amiens, begun 1218 after the plan of Robert of Luzarches, the facades completed in the 15th century, the grand choir of the cathedral of Le Mans (1217-1254), the rebuilding of the abbey church of S. Denis (after 1231). The most mature and graceful creation of the French Gothic however, is the Sainte Chapelle at Paris (Fig. 129) erected by Pierre de Montreuil for S. Louis in 1243-1248. It was designed for the preservation of the relics brought from the Holy Land, as a double chapel with three aisled lower and single aisled upper story. On its tall tracery windows with unusually magnificent glass paintings appears the tracery gable for the first time as an external termination.

In Normandy the buildings of the 13th century still generally bear the dry and severe traits of the early Gothic, that corresponded better to the Norman character than the refined art of the national style. In the ground plan is omitted the extension of the choir chapel lying on the main axis. The piers are indeed richly clustered. But the capitals retain the early Gothic bud form. Tracery is wanting. The external architectural form is dominated by the strongly emphasized crossing tower, that rises higher than the facade towers. As the most important monuments are to be mentioned the cathedrals changed from earlier buildings, those of Rouen (Fig. 130), Bayeux, Lisieux, and the two chief works of high Gothic Norman art; the three aisled cathedral of Sees and the five aisled

one of Cautances.

In southern France, where formerly the antique and also the romanesque style, continued in the same sense, had found such a favorable soil, the Gothic could only strike root very slowly. Besides through the religious and warlike disturbances to the south also remained behind the artistic development of the north. First in the 13 th century originated some expressly Gothic churches, the cathedral of Bourges, that exceptionally had a crypt, that of Clermont-Ferrand (begun 1268), the grand choirs of the cathedrals of Narbonne and of Toulouse; on them appeared the direct influence of the art of northern France. Not by time but by style belong still here also the churches of the 14 th century to the Gothic period, thus the transverse aisle of the cathedral of Bordeaux, the rich eastern building of S. Nazaire in Carcassonne and the cathedral of Albi with a single aisle, treated on the exterior like a fortress.

Likewise the buildings in Burgundy do not keep equal pace with those of Picardy and the Isle de France. The stately church of Notre Dame at Dijon, completed 1240, still follows in its ground plan the restricted square system without choir aisle and circle of chapels, and it has yet round pillars with bud capitals, but allows the maturity of high Gothic to be recognized in the well calculated system of vaults and buttresses. The church of Notre Dame in Semur and the cathedrals of Auxerre and of Lausanne are similarly arranged and developed, but the latter has already introduced richly treated clustered piers.

The late Gothic (1300-1500) in a doctrinaire way firmly adhered to the system transmitted from the best period, which it executed by an extreme slenderness and elegant lightness carried to the last results. The ground plan was preferably continued in the side aisles by parallel chapels. In elevation to the windows of the clearstory were carried into the very high triforium. The flying buttresses received a rich treatment. The entire external and internal architecture tended to a showy, graceful and refined ornamentation. The 14 th century in general remained within relatively modest limits. In view of the strenuous internal commotions and the war with England, m

many important undertakings in the great style fell into the background. Men indeed everywhere continued the previously a animated architectural activity, but limited this chiefly to completions, rebuildings and additions. To these belong as a prominent work the famous and magnificent tower of S. Pierre in Caen(after 1308). Of the more important new structures begun in the 14 th century, we have to mention the grand and nobly treated church of S. Ouen in Rouen (begun 1318). (Fig. 131). A more splendid revival was passed through by the mediaeval art of France in the 15 th century. The architects of this time still always adhered to the standards of the early Gothic style in the plans and structures of churches. Therefore they also employed only with hesitation and in the last stage the net vault, renouncing the organic development of pier and vaulted construction. But otherwise they intellectually sported with the structural principles of Gothic (Fig. 123) and utilized all variations of late Gothic forms of arches, among which besides the oggee arch and the keel arch a very flat oval arch was preferred, that is often so depressed, that it ends in a horizontal line, particularly in secular architecture, ~~sous~~ appearing merely as a half rectangle with rounded corners. The portals and windows were covered by the most luxuriant and even fanciful ornamentation. (Fig. 132). In tracery (after the beginning of the 15 th century) the flame-like and lengthwise elongated fish bladder and foil became characteristic. (Fig. 133). From these the entire French architecture of the 15 th century has received the name of flamboyant style. Among the numerous completions of structures during this time the west facade of the cathedral of Tours shows the late French Gothic in its clearest and most graceful treatment. As completed and pure creations of the flamboyant style appear the most elegantly treated church of S. Maclou at Rouen, begun in 1437 by Pierre Robin, S. Nicolas du Port near Nancy, and the church of S. Wulfram at Abbeville (after 1486), whose facade shows a crisped ornamentation. Here likewise belongs also the church of S. Maurice in Lille, originating in even the extreme north of France, which however by its plan as a five aisled hall church with slender round columns occupies a separate place among the

French churches.

II. The Netherlands.

Since the conclusion of the Frankish agreement of division at Meerssen (in the year 870), the Netherlands formed a German province, incorporated in the duchy of Lorraine. Only the ancient counties of Artois and Flanders belonged to France. After the dissolution of the duchy of Lorraine arose numerous counties and duchies directly belonging to the empire, that after 1384 were combined under the dukes of Burgundy and their heirs of the house of Hapsburg into a mighty kingdom, enclosed between Germany and the North Sea, which by wise politics and art love of its princes should for a century take an important part among the peoples of northern Europe. According to its geographical location and the racial peculiarities of its people, which in the north (Holland) were exclusively of German origin, and in the southwest bordering on France (Belgium), but partly permeated by French blood, there are two architectural domains to be distinguished on the soil of the Netherlands. The southwest province was almost entirely under the influence of French-Burgundian cathedral architecture, even if there already German influences are not to be denied. But from the beginning the northeast followed more nearly the models afforded by German Gothic. In the 15th century and under the independence of the Netherlands, strongly flourishing low German cities became the chief supporters of a great artistic movement of a chiefly German spirit.

In Belgium the architectural works continued in the forms of the transition style until the middle of the 13th century. Then the choir aisle with the circle of chapels gradually found admission. But in the interior also further the stumpy round columns were yet preferred, from whose capitals rose the rounds to the vaults. In the external structure the masters only timidly and with hesitation approached the great wall openings and the buttress system of the contemporary high French Gothic, so that the system often appears as not consistently executed. Yet these works sometimes attain a high monumentality.

To the principal works belong:-- the cathedral of S. Gudule

at Brussels, begun about 1226, with a nave and series of chapels erected since 1350, whose facade received a tall window instead of a rose window, and two massive towers, completed in the 15 th century. (Fig. 134). The Liebfrauen church in the city of Bruges, so rich in mediaeval buildings (choir built 1232-1297). The grand choir design of the cathedral of Tournai, built 1242-1338, began in the Romanesque style as a cross-shaped pier basilica. The Brabant cathedrals at Mechlin (after 1341) and at Louvain (after 1373), and particularly the imposing cathedral of Antwerp, begun 1352 (Fig. 135), of which the noble choir was still erected in the 14 th century, and the northern one of the two towers was erected only in the year 1518 (by Dominicus van Waghemakere), while the southern remained unfinished. (Fig. 136). All these architectural works are arranged according to the cathedral ground plan with choir aisle and circle of chapels.

Likewise in Holland most large churches have the rich form of choir. Yet the tendency to simplify the system here makes itself apparent everywhere, while the circle of chapels is often omitted, so that the choir aisle has a polygonal termination. The triforiums also disappear. Instead of them are arranged balustrades as recesses below the clearstory windows, which extend down to a belt above the arcade and are covered by blind tracery. The ornamental forms preserve great simplicity everywhere. Already the materials at command, bricks in combination with cut stone, limited their free development. Vaulted construction likewise did not reach a rich development; for on the insecure building soil of the overflowed **swampy low lands**, great care in construction was required in reference to the strong side thrusts of stone vaults. Therefore from the first, men frequently adhered to wooden construction, that was often built in the form of vaults in a very interesting way. Even if the height did not keep equal pace with the widening of the nave, still grand internal effects were produced. In the external appearance occurs an expressed preference for slender towers (Fig. 137), where foundations met with less difficulty, since there it was only necessary to take precautions for a load acting vertically.

108 Greatest appears the Dutch Gothic in the cathedral at Utrecht, (built 1254-1267), whose five aisled nave was torn down by a storm in 1674 and was never rebuilt. The Old church at Amsterdam originated about 1300, and the five aisled church of S. Peter at Leyden (1315) with slender round columns, low side aisles and wooden vaults display a tasteless Gothic of the 14th century. The masters of the Liebfrauen church at Dordrecht also decided for the choir aisle with the circle of chapels and also of the church of S. Stephan at Nymwegen, while the churches of Arnheim (after 1452) and of Delft, and likewise the Great church at Harlem (Fig. 138), with merely a spire over the intersection of nave and transepts instead of a tower, terminates with a polygonal choir aisle. The 15th century further produced two great churches with rich choir plan and stone vaults, the Liebfrauen church at Breda and the five aisled cathedral of S. Jan at Herzogenbusch, begun after 1419. In Friesland and Groningen are further noteworthy some country churches from the 13th and 14th centuries with domical cross vaults, which manifestly have relations with the buildings of western France. Otherwise most Dutch buildings are brick structures without stone architectural members, round columns, and vaults constructed of wood.

III. England.

The British island kingdom was the first country, that received from France the Gothic style of architecture in its earliest stage of development. After the burning of the cathedral of Canterbury in the year 1174, the French architect William of Sens was called to England with the commission to lead in the rebuilding of the choir plan. He saw in the cathedral of Sens (page 101) the most suitable model for this, and thus established the first Gothic building on English soil. But in this purely northern French conception, the transferred system prevailed but a very brief time. The English people willingly received the imparted impulses, but they wrought with the tenacious force peculiar to their national character and thus created a distinct national architectural style, that in accordance with its internal nature has maintained itself until our time.

In the ground plan (Fig. 139) then adhered also further to the former elongated plan of the Norman churches (page 60) with strongly projecting transepts and a rectangular choir without the circle of chapels. Frequently a second and sometimes a third transverse aisle in smaller dimensions is inserted, and the choir is extended by the end chapels lying on the main axis, the lady chapel (S. Mary). The structure omits the strong organic development and the alternation of the pier and vault construction. The attention to the construction is exceeded by that paid to the decoration. The English masters still adhered to the conception of the Romanesque massive construction, to which by the new means of decoration they sought to give the impression of elegant lightness. In the height of the aisles they remain far inferior to the proportions of the buildings on the continent, so that for the much greater length, the impression of the interiors of the Gothic cathedrals in England is changed from that of those on the continent. * By frequent repetition of the pointed arch in the windows and in the blind tracery on the walls, men sought to accent the upward movement and to animate the wall surfaces. Therefore they preferred to arrange the windows in groups of two or three. The triforium extending above the arcade was generally developed as an intermediate gallery story.

** The middle aisle of the cathedral of Amiens had one third its length as height, but that of the cathedral of Salisbury is only the sixth part.*

Vaulted construction attained a quite extraordinary development. England became the home of the most showy star, net and fan vaults. (Fig. 140). These are indeed conceived in a purely ornamental sense. The ribs are usually not developed as extensions from compound piers, but rest on corbels on short rounds set on the piers. Generally the stone vaults form no indispensable requirement for the English cathedrals. Besides ~~them~~ remain in use indeed in most cases the wooden ceilings common in Norman buildings, that also particularly corresponded to the island people, already well skilled in wooden construction by their shipbuilding. These were either horizontal beam ceilings, or they had the form of a gable roof, or even

that of a tunnel vault with Tudor arch section, richly decorated by painted and gilded carvings. (Fig. 141). Hence since in this manner a strong side thrust did not have to be reckoned with, as exerted by stone vaults, or that the erection of stone vaults was less effective on account of the smaller height, the design of the galleries and the greater thickness of the walls, the buttress system lost its importance. Flying buttresses were frequently omitted. Consequently the external appearance also materially differed from that of the French cathedrals. The great elevated window is characteristic for the main facade. The vertical movement is strongly expressed by the tracery, but is always reduced by frequent horizontal members. At first, as in the Romanesque period, only a massive tower was built over the crossing. Facade towers first occur in the later period and mostly terminate with a platform. (Fig. 142). As an ending of the wall, the continuous series of battlements is peculiar to English Gothic.

We likewise have to distinguish here between three periods, the Early English until 1270, the Decorated style until 1370, and the Perpendicular style of the 15th and 16th centuries. The different epochs are chiefly characterized by the architectural treatment.

The Early English style (from 1175 -1270) exhibits a careful judgment of the proportions of the masses and excellent restraint in ornamental work. In the interior is striking the separation in the arcade piers, peculiar to English art, when the massive nucleus is surrounded by four detached slender round columns. The latter stand on bases with usually circular flintings, which also recall cast iron columns by the extremely slender shafts and the low bell shaped capitals with round abacuses. The bell capital is usually decorated by plant stems with conventionalized and loosely hanging leaves. Steep pointed arches, the so-called lancet arches, terminate the narrow windows. Only modest beginnings of tracery exist, and also of flying buttresses. To the Early English is also therefore lacking the light and airy structure of continental works; it appears more like a transition style with the Romanesque basis and the ornamental use of new forms. Its most important crea-

creations are the facades of the cathedral of Peterborough (page 83), the cathedral of Lincoln (Figs. 139, 143), whose choir was begun in 1190 and was originally round with three radial chapels, but was made rectangular in the 13 th century, and whose nave (1209-1235) represents the mature Early English style. In this are found the first star vaults formed by fan-like radiation of the vault ribs. In the same time was built the cathedral of Wells with a wider facade, richly adorned by figures and flanked by two massive towers, a choir of the 15 th century and a chapter house, well known for its magnificent fan vaults. As the most important and perfect work of the Early style is to be considered the cathedral of Salisbury. Its eastern portion was erected from 1220-1250, the nave soon afterwards, and in the 14 th century the slender crossing tower, exceptionally crowned by a steep and massive pyramidal spire.

In the Decorated style (1270-1370) vividly appears the endeavor for greater development of the interior with improved construction, greater height and finer equipment. The ground plan retains its elongated form. To increase the perspective effect of the interior, the end wall of the choir is opened by a colossal window. In the tracery appear irregular foils, the fish bladder and flame-like forms (thus earlier than on the continent). England likewise preceded in the erection of net vaults. But even in this period stone vaults enjoyed no advanced esteem; even in great cathedrals they were very frequently imitated by wooden construction. If flying buttresses were constructed, they retained the simple wrought form. But the surfaces of the facade were richly subdivided by vertical mouldings. (Fig. 144).

In Westminster abbey church in London, begun in 1245 and completed about 1300, the new principles of the style appear. Yet many effects of French Gothic may be recognized in it, which manifest themselves particularly in the polygonal choir with a circle of chapels, unusual in England. The cathedral of York (nave completed 1335, choir begun 1361), a very monumentally executed structure in its external appearance, emphasized on the facades (Fig. 142) and in the interior by very decided verticalism, but the spacious middle aisle is only spanned by a wooden vault. It cannot pass as a model structure of the

rich style. The specific English conception is most purely represented in the grand cathedral at Lichfield (Figs 144, 145), substantially erected in the 14th century, on which we must mention the proud spires of the three towers as an exception to the rule, and which is distinguished by the richly subdivided clustered piers, arcade arches and ceiling vaults with ribs rising in fan-like form, and that at Hereford, where such a steep pointed arch is employed, that the spandrel almost appears as a straight line.

The Perpendicular style (1370-to about the middle of the 16th century) is so called on account of the vertical line dominating the entire architectural and decorative treatment, and it energetically subdivided the closely joined clustered piers by vaulting rounds, that in part organically rise from the floor to the vaults. The triforium was omitted, whereby the height of the side aisles was increased. Mullions and tracery with connecting horizontal bars cover the wall surfaces from the arcade to the vaults. In the windows the mullions mostly extend vertically to the soffit of the arch. The pointed arch loses its structural importance; it is depressed to the keel arch or recurved to an ogee arch. From 1450 the very low Tudor arch is at home in England, and this is again often enclosed by mouldings forming a right angle (label). (C in Fig. 124 and the portal arch in Fig. 147).

Hitherto still occurred in especially prominent buildings stone vaults in construction with an ever lower vaulting line, approximating the keel or Tudor arch, and fan-like ribs with overlaid tracery. (Fig. 148). How very greatly the structural idea was finally neglected in these appears in the fan vaults occurring in certain buildings with funnel-shaped suspended keystones. (Fig. 140). These are supported by iron rods, anchored into two free arches turned above each bay of the vault.

But about the middle of the 15th century appeared a strong reaction in favor of wooden ceilings, which were developed in the most splendid manner, both as horizontal beam ceilings as well as in visible roof framework. (Fig. 141). The blind tracery richly extending over facades also gives to the external architectural appearance of the structures in the Perpendicular-

Perpendicular style their peculiar impression, quite particularly agreeing with the English national character.

115 Already at the end of the 14th century occurred the changes in the style at the rebuilding of the nave of the cathedral of Canterbury (1378-1411), and likewise on that of the cathedral of Winchester (after 1394; Fig. 146), whose interior under the influence of the tendencies of the Perpendicular style exhibits unusually slender proportions for English churches. By its rich choir stalls the cathedral at Chester is famous (1485-1490), whose beautiful southern side portal is reproduced in Fig. 147. The richest development of fan vaults constructed in stone is attained by the Perpendicular style in the chapel of S. George of the castle at Windsor, erected 1460-1483 (Fig. 140), in which the mouldings extend in bands like joiner's work over the walls, and in a still higher degree in the stately and even capricious chapel of King's College in Cambridge (completed 1530; Fig. 148), and that of Henry VII in Westminster abbey in London. Of the more important buildings with rich wooden ceilings are yet to be mentioned the churches of S. Mary at Cambridge and at Bristol, and S. David in Wales, and Trinity church at Stratford-on-Avon.

The English cathedrals were frequently at the same time monastery churches and were then surrounded by great arrangements of buildings intended for monastery plans, among which the splendid chapter houses were arranged as purely Gothic central buildings. (See page 31 and ground plan K in Fig. 139). With them were also directly connected the establishment for learning. These occupied an important position in England and soon attained to high fame. For example, at the end of the 13th century the learned schools at Oxford were attended by nearly 30,000 students, who were lodged as fellow associates in about 300 halls, hospitals and halls, later chiefly termed colleges. In these colleges with their expensive gates, charming forms of bay windows and colossal state halls covered by richly treated vaults and showy wooden ceilings, the Perpendicular style found that peculiar continuation, which it has retained until today in its principal traits as the "English Style".

IV. Scandinavia.

In Scandinavian lands the Gothic style reached no peculiar native development. On certain monuments predominate English, on others German influences, among the latter especially those, which come from northeast Germany. These soon crossed and adopted portions of the French form expressions, transmitted by stonecutters called in 1287 from France to Sweden. On the whole the art of the Gothic middle ages in these northern lands has produced but few creations of importance.

In Norway the cathedral at Drontheim originated in the 13th century (Fig. 149) and is to be mentioned (see page 42), whose splendid octagonal choir, the tomb of S. Olaf, is kept within the forms of the Early English Gothic of the first third of the 13th century, while the three aisled nave and the transversely arranged three aisled western building with two facade towers and rich treatment of the portal recalls the early German Gothic, but now only exists in ruins. The cathedral of S. Stavanger (page 42) received (after 1272) a choir likewise built in the Early English Gothic style.

In Sweden the cathedral at Linköping forms the chief work of the period. The second building was erected (after 1232) in the transition period (the first was begun in 1150), but in its third period was changed into a hall church with clustered piers and rich window tracery. In the building of the new choir with choir aisle and three radially arranged chapels for the last quarter of the 15th century, a German master Gerlach from Cologne participated. The cathedral of Upsala was commenced in 1287 by the French architect Etienne de Bonneuil on the cathedral ground plan as a brick structure with cut stone decorations. The choir, buttress system and the clustered piers are arranged in French forms; the remaining architecture of the nave and the stately facade with two towers rather follow the German models of the Baltic provinces (with the exception of the rose window likewise completed in 1435 under French influences. On the cathedral at Upsala also depends the cross-shaped plan of the cathedral at Skara, rebuilt in the 14th century, and which exhibits in the end wall the rectangular choir with a magnificent tracery window with six bays. Great-

Greater favor was enjoyed in southern Sweden by the system of the hall church, on which is also based the churches of the B Brigittine Order. As a model building of these is to be regarded the three aisled Brigittine church with rectangular choir at Wadstena, which was erected in blue stone between 1388 and 1430. In the extreme south of Sweden the church of S. Peter at Malmö and the Frauen church at Helsingborg, both with higher middle aisle, the former with five sided choir, choir aisle and circle of chapels, the latter with three sided choir aisle without chapels, adhered to the churches of north German brick Gothic.

V. Germany, Austria and Switzerland.

In Germany the Gothic did not appear as a direct continuation of the transition style, but it penetrated from France in the course of the 13 th century as a completed art style, yet it attained in the great German cathedrals the highest measure of artistic development of which it was capable in general. The numerous residence cities of the different princes and the free cities of the Rhenish and Swabian federation of cities and of the Hansa became the centres of a business, intellectual and artistic life, which found its most prominent activity in the domain of architecture. Under the influence of the German spirit the Gothic style still adopted many peculiar traits, even if the ground plan and the form treatment were also kept within the limits of the early determined development.

For the plan of the choir, the arrangement of the choir aisle with a circle of chapels did not attain supremacy in the measure, such as was the case in France. Less attention had to be paid to the clergy, since bishops' seats existed in Germany in much smaller numbers. Therefore men decided preferably for the plan of a polygonal choir apse for each aisle, or even in large churches were satisfied with a simple choir without a choir aisle. Likewise in the development in height the dominating height of the middle aisle was mostly omitted. The equal or nearly equal heights of all three aisles corresponded to the secular feeling of the Germans for plain simplicity better, than the rich graduation and subdivision of the basilican system. Thus the hall design in city parish churches was bet-

better suited as interiors for preaching and came into preferred use, particularly in the best and the late periods.

In the treatment of the facade was rejected the horizontal subdivision, still peculiar to the French style, and which did not correspond to the nature of Gothic. The German masters here went to the last result and emphasized verticalism by the elevated painted windows over the main entrance (instead of the French rose window) and by the interruption of the cornice by the buttresses. The German Gothic attained its completest development in the particularly characteristic architecture of towers, which produced truly grand works of the highest importance, both on facades with two towers, and also especially when the entire strength was concentrated on a single tower.

Of the three periods of the Gothic style, the early Gothic **had a relatively brief duration**, since the Gothic style had already reached its climax beyond the Vosges mountains at the time of its entrance into Germany. It appeared from 1220 onward in certain monuments (cathedral at Magdeburg, Liebfrauen church at Treves, church of S. Elisabeth at Marburg; see pages 123, 120), but first came into general use about 1250. The early German Gothic is characterized by:- simply treated piers of mostly square or round cross section, with projecting half columns, rounds in the ribs, and the simple tracery in chiefly circular forms; windows divided in two parts with small and graceful columns in the jambs and mullions; natural forms of leaves on the capitals; gablet caps of buttresses, and the execution of flying buttresses in simply cut forms.

About 1300 set in the high Gothic (best period) with richly clustered piers, the equilateral pointed arch (described on an equilateral triangle) in doorways, windows and arcades, finely divided tracery, whose openings however were still early composed of geometrical figures in the most diverse variations. The jambs were moulded at each side as deeply hollowed rectangular bands (without projecting rounds), and the vault ribs were profiled in pear shape. The natural forms of the ornaments were conventionalized. The buttresses received caps with finials, and the flying buttresses had an architectural development. Tower architecture is treated in a grand manner.

The late Gothic prevails in the entire 15 th century. It favored the hall type of church without transepts, preferred to replace the clustered pier by round or octagonal supports, mostly omitting rounds and capitals, so that the ribs directly intersect the piers and walls. The architecture results in a very rich and purely ornamentally conceived form of vaults (star, net and fan vaults, doubly curved ribs), and employs by preference the ogee arch in perforated gables, depressed and shouldered arches in windows, the fish bladder in tracery, latticed intersections of mouldings in columns, knobby, withered and strongly conventionalized foliage in the ornaments. The portals were preferably furnished with expensive and splendidly treated porches (Fig. 150).

At the end of the 15 th century there appeared scattered Renaissance forms from the South, in increasing measure after 1500; until the middle of the 16 th century, these were mingled with late Gothic forms, which slowly and entirely disappeared as a result, first in the 17 th century in many places.

The wealth of Gothic monuments on German soil is extremely great, so that on account of the limited space, we can only mention the most important works in this grouping, according to the different architectural provinces.

In the Rhine country the already mentioned (page 81) Liebfrauen church at Treves (1227-1250) is the first entirely executed as Gothic, and a church structure particularly interesting by its form of ground plan as a central design, which in a spirited way utilizes the motive given in the choir of the early Gothic church of S. Yved at Braisne (near Paris; Fig. 151). It was followed by the church of S. Elisabeth at Marburg (1235-1283), a hall design on a cross-shaped ground plan with three polygonal choirs as the termination of the three aisled nave, with the two (single aisled) transverse wings and two facade towers with massive pointed spires, the entire execution being in simple and noble forms. The foundation church at Wimpfen-i-T, 1262-1278, erected by an architect returned from Paris (in opus francigenum), is a cross-shaped basilica with two Romanesque western towers from an earlier central building. Of the great cathedral at Strasburg (page 36), whose mighty impression

Goethe once described with such inspiration, the three aisled basilican and spacious nave (Fig. 152), was built 1250-1275, then the famous facade, the masterpiece of Erwin of Steinbach (died 1318), and in the 15th century the completed stone spire of the tower by Johann Hiltz from Cologne in 1439, on the whole inorganic, but rising to a height of 485.9 ft. from the substructure (foundation). On the minster at Freiburg-i-B, (page 36), the likewise basilican and three aisled nave was begun in 1253, and in 1354 the noble choir built after the plans of Johann of Gmund, with the French cathedral ground plan, having choir aisle and a circle of chapels (only completed in 1513). The western tower was placed on a simple square substructure, and wonderfully treated above, was in 1301 carried up above the bell story. In beauty of proportions it was equaled by no other one; it forms the "highest and clearest expression of the Gothic idea". (Fig. 93). The most most unified and greatest, pure in matured Gothic forms as if executed with one inspiration, architectural work is formed by the cathedral at Cologne, in dimensions surpassing nearly all other French and German churches, founded in the year 1248. (Fig. 153). The choir was completed in 1322 entirely after the type of French cathedral ground plans of the best period (page 101). It almost completely coincides with that of the cathedral of Amiens. The plan for the cathedral certainly was by master Gerard. The three aisled transepts projecting from the side walls by two bays and the five aisled nave were probably commenced after 1322 and continued until 1450. Then occurred a pause for nearly four hundred years in the building operations. Only in the 19th century the nave and the two colossal western towers were completed after the rediscovered ancient plans and with the spirited participation of the entire German nation. Of the other more important buildings of the early and the best periods, the magnificent monastery church at Altenberg-o-L (1225-1237) follows French models. On the cathedral of S. Victor in Xanten the choir plan is formed like one half the Liebfrauen church at Treves. In Hesse the church of S. Elisabeth at Marburg influences a series of buildings, among which are the principal church at Alsfeld, the foundation church at Netzar and the

city church at Friedberg. The charming church of S. Catherine at Oppenheim (1262-1317) agrees in the choir plan by the diagonally placed chapels with the Liebfrauen church at Treves, but follows the cathedral of Cologne in its rich buttress system, to whose school is likewise to be referred the grand choir building of the minster at Aix-la-Chapelle (see volume 1, page 177). In the 15 th century originated the Liebfrauen church at Worms-o-R, a cross-shaped basilica with choir aisle and two facade towers, and the church of S. Willibrod at Wesel, a heavy five aisled basilica with transepts; these go so far in richness of the treatment of the ceiling, that in the southern side aisle two systems of ribs are arranged above each other, the lower ones extending as a network over the true ceiling. Of the churches in Alsace-Lorraine, the cathedral of Metz (Fig. 154), substantially erected during the 14 th century, directly refers to French models, particularly of Rheims. The minster at Schlettstadt is a work of the early period, and likewise S. Martin in Colmar with the western facade completed in the 15 th century, also the church at Rufach. The matured and late Gothic style is represented by the church of Thann.

In southern Germany one of the first Gothic buildings is the basilican nave of the church of S. Sebald at Nuremberg, erected in the second half of the 13 th century. From 1361-1378 was added to it the spacious eastern choir as a hall design. Likewise the nave of the church of S. Lorenz there, arranged without transepts (from the second half of the 13 th century) still has the basilican plan and a very beautiful hall choir. Built in 1445-1472 after the plan of the cathedral architect, Conrad Roritzer of Regensburg. The facade with two towers retains a noble simplicity. (Fig. 155). The first complete hall church of Nuremberg is the three aisled Frauen church with square plan with single aisled choir, erected 1355-1361, rich gable and splendid two story vestibule. There follow it the extremely richly decorated chapel of S. Mary at Würzburg (after 1377), as well as the church of S. Martin at Landshut (begun before 1392), the Frauen church in Ingoldstadt (begun 1425, completed about 1500), and the Frauen church at Munich, built 1468-1488. The three buildings last mentioned were built in

the brickwork usual in the region, in severe and somewhat tasteless treatment of the forms, but with grand and enclosed internal effect. In Augsburg a master of late Gothic, Burkhard Engelberger, again attempted the earlier scheme of the cross basilica in the church of S. Ulrich (1464-1499), with luxuriant treatment in the latest forms of the Gothic style. To the French cathedral system returns the monastery church of the neighboring Kaisheim (1352-1387), a basilican cross plan with double choir aisles, the outer one of which is divided in chapels. At Regensburg in the cathedral was carried out (after 1275) the chief work of Bavarian Gothic with an early Gothic choir of three polygonal apses arranged after the German manner, basilican nave in three aisles from the 14th century and a western building (Fig. 156) with a triangular porch from the 15th century, but the stately pair of towers were first completed in the second half of the 19th century. A peculiar place among the Gothic churches of Bavaria is occupied by the twelve sided central building enclosed by low polygonal chapels, of the monastery church at Ettal in the Bavarian Alps, founded in 1330 by the emperor Louis the Bavarian, perhaps with the purpose of erecting a temple of the Graal after Wilhelm von Eschenbach's *Titirel*.

In Swabia the already mentioned foundation church at Wimpfen-i-T. (page 120) is followed by the church of S. Mary at Reutlingen (1247-1343), a basilican, spacious and nobly treated city church of the early Gothic style. As a peculiar creation for the later Swabian churches was the church of Heilige Kreuz in Schwäbisch-Gmünd, erected by Heinrich Parler (Arler) * as a hall structure with hall choir, begun about 1330, the choir building in 1351, and completed in 1521. It is a very stately three aisled design, whose nave is separated by slightly projecting transverse aisle from the elongated choir. This has a choir aisle with a circle of chapels between the buttresses, which are drawn inward. Complicated star and net vaults, that rise above slender round piers with low capitals, cover all interiors (Fig. 157); rich ornament in relief enhances the dignified general impression. The same system, but with simpler choir ending, is found in the extremely graceful Frauen c

church at Esslingen, begun 1324, (Fig. 158), in the erection of which with its splendid tower were engaged the most important Swabian masters (Ulrich of Ensingen, Matthäus Ensinger and Hans Böblinger). Here further belong the hall churches of S. Michael at Schwäbisch-Gmünd and S. George at Nordlingen and at Dinkelsbühl, also with hall choirs, while the foundation church at Stuttgart decides for the earlier form of choir, a after the example of the Frauen church at Esslingen. To a great work of the first rank the Swabian school of architecture rose in the minster at Ulm. In this building erected as a city parish church was to arise an unequalled monument of the independent and heaven-aspiring sense of the citizens of the city on the Danube, in that powerfully aroused time of the late middle ages. Designed originally (1377) as a hall plan with three aisles of equal width by masters from the Gmünd family of Parler, the building was transformed into a five aisled basilica without transverse aisle and with an elongated choir ending in a half decagon, by Ulrich of Ensingen, the greatest German architect of his time, who was also employed in Milan, Strasburg and Esslingen, taking charge of the building in Ulm in 1392. The side aisles were completed in the year 1500, and the magnificent spire of the imposing western tower, which by its height of 528.2 pt. rises about 16.4 ft. higher than the towers of Cologne cathedral and thus becomes the highest tower in the world, was only completed in the year 1890, according to the preserved designs by Matthäus Böblinger. To the Swabian master Matthias of Ensingen, the son of the above mentioned Ulrich, is also due the minster at Berne, a pier basilica without transepts and with a strongly projecting porch opening by three great arches, and with moderate facade towers.

** See page 126 under the note. That Heinrich Parler may pass as the builder of the Kreuz church is certainly an assumption, whose correctness is not yet demonstrated against all objections. (See Dehio, Handbuch der deutschen Kunstdenkmäler. Vol. 3. page 147).*

In Austria the hall type prevailed after the middle of the 14 th century. It was already represented in 1295 by the magnificent choir at Heiligenkreutz, then in 1300 by the Augustin-

Augustinian church at Vienna, and at the same time by the famous cathedral of S. Stephen there, one of the most important works of German Gothic. The three aisled nave passes into a similar choir (dedicated 1340) with a polygonal termination of the aisles after the south German manner. In stead of the transepts are arranged two towers, of which oncy that on the south side was built in a slender pyramidal form rising directly from the ground (dedicated 1433). An example of the splendid internal treatment is given by Fig. 159. In Bohemia the cathedral of S. Veit on the Hradschin at Prague (Fig. 160) is the chief work of the Gothic period. It was begun in the year 1344 by master Matthias of Arras, called from France by the emperor Charles IV, as a cross-shaped basilica in a grand style after the model of the cathedral of Narbonne with round choir, choir aisle and circle of chapels. After his death in the year 1352 the control of the building passed to the Swabian master Peter Parler, son of master Heinrich of Gmünd. * The latter was employed for 40 years on the structure, completed the choir in 1385, and commenced the massive tower structure, which took its place over the south transept as at the cathedral of S. Stephen in Vienna, but was only finished later. To the same master is also referred the church of S. Barbara at Kuttenberg (begun 1386), an originally three aisled and later five aisled basilica with high middle aisle vaulted with doubly curved ribs (Fig. 161), a low choir aisle between the buttresses, which are moved inward, and rich buttress system with doubled flying buttresses, but without facade towers. To the school of this master also belongs the Karlshofer church in Prague (founded 1351). On this the nave system is connected with the central design, since the nave adjoins an octagonal structure, that was perhaps influenced by the imperial chapel at Aix-la-Chapelle. The domical stone vault covering it appears as a highly important structural work.

* In some works on the history of art the master succeeding Matthias of Arras as architect of the cathedral of S. Veit in Prague is named Peter Arler. This appellation has been demonstrated to be a jocose falsification of the Swabian name of "Parler".

In middle Germany some architectural monuments already mentioned among the works of the transition style take an important part in the development of the Gothic style. Of basal importance was the cathedral at Magdeburg. (Page 33). It still received the Romanesque ground plan, but with the French form of choir with choir aisle and circle of chapels. Its structure was begun in the old forms but carried on after 1220 in the Gothic style; only in the 14 th century was it partly completed in late Gothic forms. Likewise the construction of the cathedral at halberstadt (Fig. 162) continues through the 13 th, 14 th and 15 th centuries. The cathedral at Naumburg received about 1270 its early Gothic western choir. At about the same time the cathedral at Meissen was founded as a basilican plan with transverse aisle, whose nave was changed into a hall church in the 14 th century. The like change was experienced in the 14 th century by the spacious church of S. Mary at Mühlhausen in Thuringia, now with five aisles, and in the second half of the 15 th century by the three aisled cathedral at Erfurt, enthroned on a massive substructure. The late period further produced a connected group of hall churches in the east of middle Germany, that exhibit the octagonal piers with hollowed sides (shallow flutes) and the shouldered arch (page 96) in the windows as special peculiarities. Here belong the church of S. John in Plauen (1450), the church of S. Maria in Zwickau (after 1465), the cathedral at Freiberg-i-S. (after 1485), the Anna church in Annaberg (1499), the Wolfgang church in Schneeberg (1515), the City church at Pirna (after 1502) and the Castle church at Chemnitz (1514-1525).

In Westphalia the hall form is the expressed native type of building. We have already referred to the cathedrals at Paderborn and Minden (page 34). The latter can also be counted among the chief works of early Gothic on account of its spaciousness and the magnificent decoration of its nave with rich blind tracery. In the 14 th century, there originated as model hall churches with nearly square ground plans the church of S. Maria at Herford and the Wiesen church at Soest, that carried to the extreme result the Gothic principle of construction by omitting the capitals etc. A form of larger ground plan after

the model of the Hessian churches is shown by the Liebfrauen church at Münster and the Catharine church at Osnabrück. The two aisled porch erected in 1469-1474 in the place of the northern side aisle of the cathedral at Brunswick (Fig. 163) is a characteristic show piece of mechanical and technical ability of stonecutters in the late Gothic period.

The north German lowlands occupy a separate place in the evolution of the Gothic style, because its forms are changed into brickwork, the ancient native material. With the splendid Cistercian church at Chorin in Brandenburg (1274-1334) appears a fresh brick Gothic, true to the material, that was further developed by the mendicant Orders succeeding the Cistercians. The latter brought into use particularly the hall construction. On the church of S. Maria in Neubrandenburg, dedicated 1298, the detached mullions and tracery recall the gable on the Strasburg minster. In a similar manner, but considerably richer in treatment is the great show gable concealing the three aisles of the church of S. Maria at Prenzlau (1328-1340), on which red and dark glazed bricks alternate. It characterizes most strikingly the special style of the Mark. The matured rich style of brick Gothic at the change from the 14 th to the 15 th century is represented by the church of S. Maria at Königsberg in the Neumark (tower from 1458), and the Catherine church at Brandenburg. The Stephen church in Tangermünde (after 1470) is old, transformed into a Gothic basilica with choir, transverse aisle and chapel. To the 15 th century also belong the two splendid principal churches at Stendal, the cathedral and the church of S. Maria, both hall churches with two western towers.

In the Baltic provinces the brick Gothic developed a luxuriant magnificence, especially in the Hansa cities. Men there left the French cathedral ground plans with choir aisle and circle of chapels and erected the buildings according to the basilican scheme, whereby the surfaces of the facades were animated by an alternation of black glazed and colored bricks, sometimes also by blind tracery on a white ground. The ornamental decorations were in terra cotta (Fig. 164). Thus originated the church of S. Maria at Lübeck (1270-1310), the church of S.

Maria at Rostock in the 14th century, the churches of S. Maria and of S. Nicolas at Wismar, the churches of S. Nicolas at Greifswald and at Stralsund, and among monastery churches the charming Cistercian church at Doberan. The hall system is represented by the church of S. Johann at Thorn, begun in 1260, and by a very rich monument in the cathedral at Frauenberg, completed 1388. The two great hall churches of S. Peter at Lübeck, five aisled, and of S. Maria at Danzig, a three aisled plan, are in their essential architectural parts, works of the late Gothic of the 15th century.

VI. Italy.

Already about 1200, and thus at a time when the Gothic in France had not reached full maturity, its style of art also penetrated from France into Italy by the mediation of the Cistercians. But what characterized the northern Gothic, the resolution of the masses, the buttress system and the tendency toward height, were not adopted by the Italian masters. To their inborn art feeling, strengthened by many centuries of exercise corresponded only wide interiors of moderate height and a horizontal subdivision of the masses. And yet the general spirit of the time influenced them so strongly, that supported by the particularly strong influence of the Cistercians in Italy and that of the succeeding mendicant Orders, it brought about 1250 a complete break with antique traditions, which continued until the end of the 14th century. In the pointed arch was presented a welcome means of covering as wide interiors as possible. But the wall surfaces retained their southern privilege on account of the expressed enjoyment of monumental paintings. The wide-arched middle aisle with like placing of the supports and high side aisles, over which in the clear-story remained only space for small and frequently circular windows, that were still sufficient beneath the southern sky, produced a wonderfully harmonious internal effect, that exhibits an individuality totally different from the narrow and lofty cathedrals of the North. (Compare Figs. 168 and 170 with 130). In reference to the creation of the interior, the greatest was undertaken on Italian soil; for no cathedral of the North equals that of S. Petronio or of the cathedral of Milan.

The architectural treatment but seldom shows the strict Gothic principle; this remained unknown to most Italian architects. The polygonal pier was far more simply treated, mostly without regard to the direct relations of the rounds and the plan of the vaults. On the relatively strongly developed capitals is but exceptionally found natural foliage, and so much more commonly the bud forms of the transition style with leaf shapes, that still recall the acanthus. The window tracery assumes a flat character. To the entire exterior is lacking the rich subdivision in the sense of the northern Gothic. The low and thereby light roofs of the South make lower side walls and the buttress system is unnecessary. The flying buttress can be entirely omitted in view of the higher side aisles, in consequence of which the clearstory walls extend but little above the side aisles; the buttresses assume more the character of Romanesque wall strips. Not infrequently are iron rods and even anchored wooden beams inserted at the imposts of the vaults to receive their side thrust. (Fig. 170). Towers were not included in the general organism. One bell tower stood beside the building as if detached. (Fig. 171). In the development of the facade only chiefly the pointed arches, triforium, the pattern-like tracery gables and finials with imitations of the crockets and cross-flowers recall the northern Gothic. Very frequently is employed a means foreign to the nature of the style, facings of marble in different colors. The western facade was treated as a particular show piece. The enjoyment of the Italians in ornamental accessories rose here to an extravagant abundance of sculptured and mosaic decoration. (Fig. 169). In the ground plan occurred the cathedral type in comparatively small measure. The churches influenced by the Cistercians and Franciscans generally have the rectangular enclosed choir with similar side chapels. This choir plan in north Italy is joined by a three aisled vaulted nave, in Tuscany and Umbria by a single aisled nave with visible roof framework.

In the development of Italian-Gothic art lower Italy indeed precedes in time. The abbey church of the Cistercians at Fossanuova, erected by French architects after French models (abbey church at Pontigni, page 46), was already dedicated in 1208.

Its influence may be followed in numerous churches between the Tuscan and Adriatic Seas, in the south to Calabria (Cosenza) and in the north to Tuscany (Siena). But the chief region for the development of Italian-Gothic art lies in upper and middle Italy, particularly in Lombardy, in Tuscany and in adjacent Umbria.

In upper Italy S. Andrea at Vercelli (after 1219) is the oldest Gothic church. Its clustered columns and buttresses permit the recognition of the direct influence of Parisian early Gothic. In the second quarter of the 13th century was located the great architectural activity of the Franciscans, and in the last quarter was that of the Dominicans. S. Francesco in Bologna (after 1246) represents the cathedral type with choir aisle and square chapels (like the abbey church at Pontigny in Burgundy). The nave still follows the restricted system of vaulting. The same form of choir is shown by S. Antonio in Padua. (1232-1307). In the vaulting of the nave and transverse aisle are expressed here the strong influence of the domed system of S. Marco in Venice. About the end of the 13th century vaulted churches became more common. The piers became round and received octagonal abacuses. Then arose S. Lorenzo in Vicenza (1280), the Franciscan church dei Frari (1330) and the Dominican church of S. Giovanni e Paolo in Venice (1333). S. Maria del Carmine in Padua (begun 1373) retains the Lombard construction with square bays. The facade is the noblest example of the early Gothic style of upper Italy.

An independent position is taken by the famous church of the Certosa (Carthusian monastery) near Pavia (Fig. 165), built after 1346 by Marco di Campione as a three aisled plan with chapels at both sides of the nave, transverse aisle and choir, the latter arranged as three equal arms of the cross and terminating in trefoil form with three apses. The vaults are pointed. But in the arcades and windows are already found the round arches of the early Renaissance, which presents one of its finest and most magnificent works in the noble marble facade.

To the founder of the Certosa, duke Galeazzo Visconti, is also to be referred the principal church in the Gothic of upper Italy, the cathedral of Milan. It was commenced in 1386 as a cross-shaped plan with five aisled nave in the basilican char-

basilican character, but without clearstories. The two outer side aisles are considerably lower than the middle one; the transepts are three aisled, the choir octagonal with choir aisle and without the circle of chapels. In its entire structure with clustered piers and developed system of buttresses is expressed the influence of northern art much more strongly than in the other Gothic cathedrals of Italy. During the erection of the building German masters were frequently called in, like Heinrich Parler of Gmünd and Ulrich of Ensingen (see page 124), when the Italian architects helplessly attacked the resulting structural difficulties. The colossal structure reached completion first in the 19th century, after it had received many additions in later times, foreign to its style forms. But in its entire external architecture, executed in noble white marble, the Milanese cathedral appears as a luxuriant conservatory of the richest sculptured ornamental work (Fig. 166), that covers the nowise harmonious organism of the building like a splendid state garment. Yet far greater than the cathedral of Milan, whose internal area is equaled by no other Gothic church in the world, the rich city of Bologna conceived the idea of establishing a church dedicated to its greatly venerated protecting saint, S. Petronio. According to the plan designed by Antonio di Vicenzio of Bologna with the assistance of Fra Andrea Manfredi, a colossal structure of unheard of dimensions should arise with a length of 708.7 ft. and a width of 355.6 ft. across the transepts. (The corresponding dimensions of the Milanese cathedral are 485.3 and 288.7 ft.), as a three aisled basilica of the cathedral type, yet with square chapels (according to the precedent of S. Francesco there, see page 132), which should also extend along both sides of the transepts and of the nave. Unfortunately only the nave came to be erected. Political occurrences and the beginning of the Renaissance brought the building to a stand. In the year 1647 it was decided to not continue the work further and to terminate the nave by a small choir niche. But even as a fragment, S. Petronio presents to us the most perfect interior in Italian Gothic. Of the small Gothic churches of upper Italy, S. Maria in Strada at Monza (after 1393) affords an attractive example. (Fig. 167).

In middle Italy already in 1228, thus at a time when Germany could show no real Gothic principal churches, one of the chief Gothic churches of Italy was founded in S. Francesco at Assisi. The high terraced site was utilized for the construction of a lower church, over which rises a single aisled upper church, consisting of five square bays, of which the eastern one is extended by an altar apse, and at both sides by somewhat smaller bays forming transepts. Bold wall piers, subdivided in the sense of the northern architecture, support the cross vaults and their ribs, treated as wide moulded supports. The effect of this unified and undivided interior is uncommonly dignified and imposing, being supported by the artistically very important frescos. The churches built by the Franciscans, of S. Francesco at Siena, Pistoja, Pisa and Cortona have the ground plan of the monastery churches of the Cistercians with square and cross vaulted choir, that is flanked by similarly arranged small chapels. Their most important and truly grand work is the great church of S. Croce in Florence, begun in 1294 after the plans of the cathedral architect Arnolfo di Cambio as a three aisled and spacious basilica with transepts, which are enlarged on the eastern side by ten chapels, whose centre is occupied by the polygonal choir. The interior exhibits in the middle and side aisles the visible framework of the roof. (Fig. 168). The dazzling white marble facade is a work of the 13th century executed after an old design.

Otherwise the churches of the mendicant Orders are externally plain rough brick buildings, whose facades still await their facings. The Dominicans followed basal principles similar to those of the Franciscans, but besides the single and three aisled churches with visible roof framework also created such with vaults, and originated the beautiful three aisled and vaulted and cross-shaped basilica of S. Maria Novella in Florence, begun in 1278 by the Dominicans Sisto and Ristori, completed in 1357 by Jacopo Talenti. It is the noblest work of Tuscan Gothic. * Its system is afterwards met with in the cathedral of Arezzo, located farther south. Giovanni Pisano erected in Pisa the famous Campo Santo (1278-1283) a rectangular cloister surrounded by porticos internally beside the cathedral. The

little church of S. Maria della Spina there was built in 1230 and enlarged in 1323 has a rich marble show facade, on which the luxuriant finals are quite loosely placed.

The epoch-making chief creations of the Gothic in middle Italy are the great cathedrals of Siena, Orvieto and Florence. The cathedral at Siena was begun before 1250 as a three aisled nave with similar transepts and a choir, that appears as a continuation of the nave and ends in rectangular form. The piers with square nucleus and four half columns are faced with alternate courses of white and dark green marble. The entire interior is covered by round arched cross vaults; over the intersection of the nave and the transepts rises an inorganically placed dome over a hexagon set diagonally and changing above into a twelve-sided polygon. A true masterpiece is the facade designed by Giovanni Pisano in 1284, executed in light, dark and red marbles, furnished with overrich sculptures, on which scarcely one stone remains without ornament. (Fig. 169).

** Michael Angelo was so enraptured by the church of S. Maria Novella, that he called it his bride.*

In striking contrast to it is executed the facade of the cathedral of Orvieto. The building was commenced before 1285 and from 1310 was carried on by the Siena architect Lorenzo Maitani. The architectural members here have somewhat reduced projections in favor of an unusually rich and splendidly colored mosaic ornamentation. Not only do the tympanums and wall panels gleam with figure compositions on a gold ground in glowing splendor (indeed but partially belonging to the 14th century), but also all purely structural members, even the finials are covered by mosaic decoration. The interior is a three aisled columnar basilica with visible ornamented roof framing over the nave and vaulted transepts and choir, that terminates just like that in Siena.

The cathedral in Florence was begun in 1296 by Arnolfo di Cambio, was interrupted repeatedly, and after long conferences and several competitions was completed in the year 1462 by different masters, among whom are to be named the famous painter Giotto di Bondone, Francesco Talenti, and the great Roman master Filippo Brunelleschi. The great aim of the Florentines was to establish in it a work, which should surpass all other.

churches of Italy. The ground plan is composed of a three aisled nave with four continuous bays and a central structure, that consists of an octagonal domed space and of three polygonal apses occupying the places of the transepts and choir. The apses are each enlarged by five square chapels lying between the buttresses, that are drawn inward. In the structure the Gothic style assumes an expressed Italian character, where the ornamental forms of the Gothic are fused with antique subdivisions and arrangement of lines. The interior (Fig. 170) is more effective by the bold proportions of the arches of wide span, than by the perfect harmony of all parts, the exterior by the facing with white and dark green marble slabs. The main facade was even commenced in the 14 th century, was richly adorned by statues and reliefs, but in 1587 as being "opposed to" architectural rules and reason", it was removed and only erected anew in the last quarter of the 19 th century with reference to the ancient plans. In perfected beauty parades the bell tower erected beside the cathedral. (Fig. 171). Giotto designed the plans in 1334, which were also retained in general by the later architects. The tower rises from a square ground area undiminished to a height of 275.6 ft., and indeed has an enrapturing effect by its dignified marble covering, finely treated cornices, and the rich handling of the windows, ever becoming larger upwards. (Fig. 172).

All these churches belong to the basilican type. The hall system is only represented in the Gothic period in Italy in the cathedral of Perugia with three aisles of equal height, after the northern manner (as in the church of S. Elisabeth at Marburg). It was begun in 1300, but probably first transformed into a Gothic hall church by its rebuilding in 1447. To the 15 th century likewise belongs the cathedral of Pienza, which on the order of the Pope was imitated from an Austrian hall church, but only appears Gothic in the ground plan and the treatment of the vaults, while the architectural details and the facades already exhibit the forms of the early Renaissance.

The capital city of Rome remained far behind in the rich and great architectural activity of the cities of upper and middle

Italy, on account of the unfavorable political conditions -- the noble families were in strong enmity in the Gothic period with each other, the people and the Papacy. The Cosmati (page 53) indeed enriched their minor architectural works with Gothic forms, and had created magnificent works, with which furthermore the works of Florentine masters competed even on Roman soil. The single great architectural work of Gothic in Rome is the vaulted church of S. Maria sopra Minerva, erected after 1280 by the Dominicans, whose three aisled nave is enlarged by side chapels, and whose transepts likewise end in choir chapels, the middle one terminating with a semicircular apse.

In lower Italy the dry early Gothic developed in the time of the Hohenstaufens, but still rather remaining in the transition stage, was introduced by the Cistercian church at Fossanuova (page 131), under the French monarchs of the house of Anjou (1266-1442) was succeeded by a "decomposed and reduced late Gothic" of a Burgundian type, of which S. Lorenzo in Naples (1266-1324), a church of the cathedral type with choir aisle and five radial chapels, represents the most important monument. In Sicily the earnest Norman architectural forms are combined with the gayer Mohammedan ornament and the Byzantine splendor of pictures into a harmonious unity of peculiar magnificence. (Fig. 173). The porch of the south side of the cathedral of Palermo (Fig. 174) is a work of this style from the middle of the 14th century.

Offshoots of the Gothic of lower Italy also found admission farther East in Cyprus by the mediation of the crusades, where among others the metropolitan church of S. Sophie in Nicosia, erected at the beginning of the 13th century, exhibits a plan allied to the cathedrals at Sens and Paris, yet wanting the circle of chapels. Even in the Holy Land may be followed the echoes of this style in church architecture, even if there are also proved now in few architectural remains.

VI. Spain and Portugal.

About the middle of the 13th century the Gothic style found entrance into the Iberian peninsula, and indeed it was the art style of northern France, which in its full maturity was chiefly introduced by the mediation of the Cistercians. Yet the

style only attained here in a limited sense to an independent development. The two young Christian kingdoms of Aragon and Castile were in the 13 th and 14 th centuries too much occupied with the arrangement of their political conditions, to be able to devote themselves to an energetic fostering of art, and likewise Portugal, and when in the course of the 15 th century the people of the Iberian peninsula were favored by the epoch-making discoveries of their seamen, and rose for a brief period to a world supremacy, by which unexpected wealth flowed to them, then men were compelled to call foreign artists into the country. Chiefly Netherlanders, Germans and Italians were invited. On the works instituted by them was gradually formed an independent and natural style of art, but which was less expressed in the form of plan of the buildings, than in their spaciousness and luxuriant and ornamental treatment of the southern character.

In Spain the churches retained the high enclosure of the priests' choir in the middle aisle (page 57), placed their most sacred chapel (capilla mayor) instead of the northern choir, connecting this with the priests' choir by a latticed passage. The side aisles were enlarged by rows of chapels, that were frequently continued at all external walls. In regard to the form of ground plan, there appeared such a great preference for the French cathedral system with choir aisle and rich circle of chapels, that men firmly adhered long to there, even during the victorious advancement of the Renaissance. Also in this the Spanish cathedrals pursue a course peculiar to them in that they retain the cloister and even treat it richly, while the principal northern churches of the bishops' omit it as a rule after the 13 th century. As in the general plan so also in the axial relations and the like were the prototypes of northern France at first determinative. With the beginning of the 14 th century appear more strongly the influences of the art style of southern France. The architects first of all aimed to create grand interiors, and they completed these with very important structural works. But thereby also the basilican type first disappeared in the northeast and in the 15 th and 16 th centuries in all Spain. Church architecture turned

to the hall system, which favored the endeavor for a unified treatment of the interior. This appears in the northern provinces in its pure form, but in the middle and southern regions passed into a peculiar development. There the buildings assume a very wide plan in the form of a slightly elongated rectangle with five or seven aisles, among which the middle and that taken as the transverse aisle are but moderately wider than the others and are but little higher. The eastern side terminates either in a rectangle or in small chapels, which are repeated along the sides. Thus these Spanish church buildings approximate in the form of ground plan to the arrangement of the mosque usual among the Moors.

The structure continues in the forms of its prototype, on which the works are based, or with which the masters were acquainted in their native country. Therefore it is very rich in changes. But the window openings were chiefly limited to smaller dimensions in comparison to those of the northern churches. The heights of the side aisles as a rule were reduced outward (as at the cathedral of Milan, page 133). The tower structure over the crossing, already peculiar to Spanish churches in the Romanesque period (ciborio, page 58), was retained and treated with particular richness. (Fig. 177).

In architecture and decoration the Spanish art spirit first appeared more strongly; there developed that rich and flourishing late Gothic style, which the Spaniards designate as "estilo florido". Almost the entire second half of this century belongs to it. It is also much permeated by Moorish motives, but follows the basal course of the luxuriant Flamboyant (Fig. 175). Besides it the Mudejar style (see volume 1, page 124) practised by the Moorish workmen and artists, more indeed in palaces than in church buildings, reached a splendid development, to which Moorish technique and the Moorish ornamental style, with the adoption of Gothic lines and decorative forms, gave its individual stamp. (Fig. 176).

About the end of the 15th century appeared an enrichment of the ornamental expedients of architecture peculiar to Spanish art. In the continued endeavor to heighten the artistic effect, the ornamental forms of metal work, particularly those of

the goldsmith's art, which then flourished greatly in Spain, also found entrance into architecture at a time, in which the new Renaissance motives came there from Italy. Thus originated the Plateresco, i.e., "goldsmith's style", in which the flourishing Flamboyant was fused with the fine patterns of the Mudéjar and the elements of the early Italian Renaissance into an extraordinarily graceful and showy art style. Its beginnings go back to the year 1480, but it only reached full maturity in the 16th century.

The three chief works of Spanish Gothic of the 13th century belong to the school of northern France; these are the cathedrals of Burgos, Toledo and Leon. The cathedral of Burgos (Fig. 177) was founded in 1221, and is a three-aisled cross-shaped basilica with choir aisle and rich circle of chapels. The nave has clustered piers with massive round piers in the choir and rich decorations on bases and shafts. The facade forms the show piece of Spanish Gothic architecture. The two state-ly western towers were erected in complete consistency by a German master Johann from Cologne (1442-1458). (Fig. 179). Yet more imposingly planned in proportions is the cathedral of Toledo (Fig. 180), begun 1227, with a double choir aisles and a circle of chapels, that are continued to the western facade, adorned internally by richly subdivided piers and splendid show decoration, interwoven in which are Moorish motives of many kinds. The cathedral of Leon was built in the second half of the 13th century and bears strongly expressed the traits of the Gothic of northern France, that may be recognized in the almost complete resolution of the walls into the windows. In the lines of its plan, it follows the system of the plan of the cathedral of Rheims. At the end of the 13th century was also commenced the cathedral of Barcelona (1298-1448), a three-aisled building with chapels between the buttresses moved inward, arches of very wide spans on unusually slender piers, airy galleries over the side aisles, and a but moderately raised middle aisle. Yet wider is the middle aisle of Maria del Mar in Barcelona (1328-1383), widest of all churches on the Spanish mainland being that of the collegiate church of Manresa (near Barcelona) with a distance of 50 ft. between axes. But

even this dimension is still inferior to that of 64 ft. in the middle aisle of the cathedral in Palma on the island of Mallorca, allied to the cathedral of Florence in spaciousness. Finally the cathedral of Gerona (in northeast Spain) in its single aisled nave extended by chapels and placed before the three aisled choir, -- it was originally planned with three aisles, -- reaches in the four cross vaults a span of 73.0 ft., the greatest span of a vault in all mediaeval architecture.

The hall type is splendidly represented by the cathedral of Saragossa. (Zaragoza). This building was erected after 1318 as a rectangular ground plan with five aisles and five bays in each, a row of chapels on both sides, transepts, which do not project beyond the line of the chapels, three abses and a cimborio, the largest hall church in the world. The chief work of the 15 th century is the cathedral of Seville, planned in colossal dimensions and built after 1403 on the site of the old chief mosque. Its ground plan has the form of a rectangle, including a five aisled nave and single transverse aisle with the same width as the middle aisle, with rows of chapels between the buttresses drawn inward along both longer sides and at the altar end. By the strong elevation of the side aisles, the interior makes the impression of a hall church. All rooms have cross vaults with the exception of the crossing, that is covered by a domical vault instead of the cimborio, that fell in 1512. The tower in its lower portions belonged to the mosque, the famous Giralda, the emblem of Seville, and serves as the bell tower. Of the hall type native in the north is the church at Medina del Campo, and of the hall churchss, the monastery church of S. Juan de los Reyes in Toledo (after 1477), treated in the most luxuriant Plateresco, are to be mentioned, and whose splendid cloister is represented in Fig. 181.

Even in the 16 th century Gothic architectural works of importance were erected in Spain; the cathedral of Salamanca, begun in 1512, designed by Anton Egas and Alfonso Rodriguez, cathedral architects of Toledo and Seville, and that is a mean between those of Toledo and Seville, has a three aisled plan with rows of chapels on three sides, and shows a developed buttress system in the structure, and further the cathedral of S

Segovia, erected after 1522 in noble and still pure late Gothic forms, as well as the cathedral of Granada, begun in 1523 by Enrique de Egas (a brother of the previously mentioned Anton Egas), which however only shows the Gothic design in the ground plan, but the structure is entirely arranged in the forms of the Renaissance.

Portugal likewise in the 13 th and 14 th centuries did not attain an artistic independence (Fig. 59). The international Gothic imported from France and Spain at first only occasionally exhibits Moorish tendencies. First about the end of the 15 th century with the great political rise of the country appeared an independent and rich art climax, that (after 1480) runs parallel to the development of the Plateresque style in Spain, but in Portugal the Moorish mode of ornamentation becomes stronger and later (after Vasco di Gama's return from the East Indies in the year 1499)., even Indian forms are adopted. In the 16 th century with this luxuriant style (arte manuelina) after the great king Emanuel (1495-1521) * are combined the forms of the early Italian Renaissance. These were chiefly introduced into Portuguese art by the Italian master Andrea Sansovino, who was called to Lisbon by Emanuel's predecessor, Johann II. To this were yet added finally numerous motives of Netherlandish art by means of sea voyages. The architectural and ornamental forms so originated did not in the end prove progressive and faithful; but considered by themselves, they still form an interesting mode of expression with a peculiarly fascinating charm. (Fig. 182).

** Under the wise government of this monarch blossomed the "golden age" for Portugal.*

As the earliest work is to be mentioned the Cistercian church of Alcobaca, already commenced in the Romanesque period and dedicated in 1222 (page 59), whose choir represents the Burgundian cathedral system, while the nave is influenced by the church architecture of western France. The developed Portuguese Gothic art finds its centre in the grand monastery design at Batalha. Founded in the year 1385 after the splendid victory of the Portuguese over the Spaniards, which secured their independence, the monastery was intended for the Dominicans and

first acquired the church, a three aisled basilican structure with high side aisles, transepts and five parallel choirs after the style of Cistercian designs, but with polygonal apses. To this were added the square tomb chapel of the founder, erected in the line of the facade and attached to the nave, also the great cloister and the refectory, chapter hall, and the other buildings belonging to the monastery plan. About 1450 was added a second cloister, and in 1551 a third square of buildings with a cloister. It seems doubtful that English influences contributed to laying out the plan. The artistically most noteworthy portion of the architecture is the "capellas imperfeitas", added after the beginning of the 15th century: at the eastern part of the church on its middle axis, a great octagonal central building, that if it were completed, would form the most important Gothic central structure, besides the Liebfrauen church at Treves. The lower story bears expressed English traits. The upper story (after 1491) was extended by Joao de Castilho, the greatest architect of Portugal's best period. It is showy in that fancifully combined style form, from Gothic, Moorish, Indian and Renaissance elements, in which the latter gradually attained predominance. The developed Manuel style of the 16th century is most characteristically shown by the choir of the Knights of Christ at Thomar (Fig. 184) and the charming monastery church at Belem (after 1500), a magnificent hall design with net vaults above richly decorated slender piers (Fig. 185). Above the church lies the enrapturing cloister represented in Fig. 286, whose principal motives however already belong to the form series of the succeeding period.

B. Monastery Designs and allied Groups of Buildings.

However deeply the Order of Cistercians and those of the succeeding Franciscans and Dominicans were concerned in the evolution and spread of the Gothic, and also how great was the architectural activity developed by them in the erection of churches and monasteries, they introduced no substantially new ideas in the design of the monasteries themselves; afterwards as before, the scheme of the monastery of S. Gall remained de-

determinative (see volume 1, page 182), even if also occasionally varied or new buildings were based upon it in a richer or simpler manner. Larger plans sometimes provided two refectories, one for summer, the other for winter. The fountain house (Figs. 186, 187) was frequently treated as a small central building, with glass paintings in the windows similar to those of the cloister. Instead of the common dormitory usually appeared the living cells built for the individual members.

To frequently very extensive groups of structures grew in time the settlements of the great Orders of the Cistercians and Benedictines, provided with estates. In the erection of monastery churches even for the Cistercians, their characteristic form of plan not seldom was changed to the usual arrangement. Magnificent examples of great Cistercian foundations completed in the Gothic period are found at Maulbronn and Bebenhausen in Swabia. The abbey at Maulbronn (pages 311-38) is of unique archaeological worth on account of its rich design and complete preservation. The most important portions of the buildings still belong to the Romanesque period. Through the porch a (paradise; see page 149) of the ground plan in Fig. 986 one enters the three aisled church (dedicated 1178). It terminates in a rectangular choir without apse and with a row of chapels, was originally covered by a horizontal ceiling, but was furnished with net vaults in 1424. By the system of buttresses then introduced, the nave was extended by chapels on the south side. After these building eras followed in 1201 the council hall i, the lay refectory g and the porch (paradise) a (about 1215). About 1225 was built the monks' refectory h and also the south wing of the cloister extending beside the church. (Fig. 40). Between the two refectories lay the kitchen. Past the chapter house m, erected beside the transept of the church, led the convensation hall (parlatorium), covered by rich net vaults to the abbot's house o, that was erected in strong wooden construction (1512-1518). The wing of the building denoted by k is a two aisled cellar; f is the picturesque fountain house reproduced in Fig. 187. Outside this inner closure lie the farm buildings. The entire monastery is entirely enclosed by strong outer walls. In northern Germany the

abbeys at Lehnin and Chorin also received structures in noble brick Gothic. The Austrian monasteries at Heiligenkreuz, Zwettl and Lilienfeld were enlarged in the Gothic period, and the Bohemian Cistercian abbeys at Goldenkron and Hohenfurt were in great part built. In France among others the abbeys at Fontenay, Fontfroide and Ourscamp belong to the noblest creations of early Gothic, likewise the splendidly located and well fortified Benedictine settlement of Mont-Saint-Michel in Normandy.

The Franciscans and Dominicans in general remained faithful to the simplicity taught by them (in Regensburg, Constance, Esslingen, Basle, Strasburg, Erfurt and Cologne). Their churches for a long time had horizontal ceilings. Somewhat more expressive are the Carthusian designs, whose cloisters already assumed great dimensions with reference to the cell system introduced by them (Carthusian monastery in Nuremberg, now German Museum). When the monasteries were founded or particularly favored by neighboring princes, there also originated richer designs with splendid decorations, as for example at the already mentioned Certosa near Pavia (page 132) and the Dominican monastery at Batalha. (Page 147).

Separate cloisters were further common near the great principal churches of bishops in Spain (page 140) and also in England till the 15 th century, among others in Salisbury, Durham and Gloucester; a view of the richness of the latter is given in Fig. 188. In France, Italy and Germany they were only exceptionally built from the high Gothic period onward. The still existing cathedral cloisters in Laon, Magdeburg, Erfurt and Regensburg are noteworthy monuments in the history of art.

An intermediate position between monastery and palace architecture is taken by the castles of the German Orders of knights. Their finest example is the Marienberg near Danzig. It was begun in the year 1280 and in the 14 th century was rebuilt and materially enlarged, after the seat of the grand master had been transferred there (1309). The different structures are grouped around the rectangular two story cloister, on whose northern side lies the church of S. Maria as the chapter hall. The east wing is occupied by the dormitories, the west wing by the dwellings of the higher knights, and on the south

side are found the living hall and the great refectory. Between 1357 and 1382 was erected the castle of the grand master, after the outer castle had been removed further. In it the mechanics of the Order, who had proved themselves particularly competent masters in the construction of fan and star vaults, and introduced among the forms of northern German brick and Rhenish Gothic many motives from the Norman art in Sicily known to them, produced an artistically prominent work, not only in the internal architecture (Fig. 189), but also in the external subdivision and animation of the wall surfaces. In like manner the castle of Carlstein in Bohemia, erected in 1348-1365 by Matthias of Arras under Charles IV, is a combination of castle and monastery architecture. It must serve as a permanent seat of a collegiate chapter, as a treasury for the jewels of the empire, and at least in part as a residence for the princes of the country. In France originated in the 14th century the stately castle of the Popes at Avignon, intended for similar purposes. More modest were the bishops' palaces, of which considerable remains exist in France and England, (Laon, Sens, Narbonne, Wells) and in the southern countries, which are still partly complete monuments.

Likewise the hospitals are always connected with buildings for divine service. For sanitary reasons they were mostly built near flowing streams on the outskirts of cities, and for their ground plans were selected either the cloister plan, as for example at the hospital at Cues on the Moselle, founded in 1450, or a direct combination of chapel and hall for the sick, like the Heiligengeist hospital at Lübeck, founded in 1276, and the hospital at Frankfort-a-M. The great model structure at Milan (Ospedale Maggiore) already stands on the transition stage to the Italian Renaissance.

C. Gothic Secular Architecture.

In a period when the greatest deeds were seen in the erection of cathedrals aspiring towards heaven, secular architecture could not rise to the high stage of perfection, to which church architecture had soared. Yet also secular architecture, under the increasing participation of the princes, the higher and middle nobility, of the citizens acquiring great wealth, as w

well as the cities and within them the secular assemblies and associations, was favored by the fact, that the practice of the art had passed into the hands of laymen, to record very noteworthy works, in part grand and equal to church architecture.

The most important problems fell to secular architecture in the erection of castles, forts and palaces as the residences of reigning princes and of the nobility. As a rule they reflect the purpose, being first of all directed to strength and capacity for defense in a period affected by wars, and they chiefly assume the character of a fortress, even if they lie within well fortified cities. The plan is at first quite irregular, but later it generally approximates the rectangular form with strong defensive towers at the angles. About from the middle of the 14th century onward the princely residences and castles gradually lose their previously innate character of buildings exclusively for defense and safety. In increasing measure is attention devoted to the requirements for residence. From the treatment of the proud halls and rooms, the Gothic minor arts derive great advantage. The walls were mostly furnished with paneling, that sometimes extended the entire height, and in their treatment with bands and blind tracery were repeated the architectural forms transferred to the minor arts. (Fig. 191). On the ceilings the framework was left entirely visible, or it was furnished with paneling, especially in the smaller rooms. In the larger apartments the ceilings were either treated as vaults, executed in stone with a rich arrangement of ribs, with wooden ceilings having cross strips or on beams, which were very showily treated, particularly in England.

Within essentially more modest limits were restricted the dwellings of the patricians and well to do citizens. In consequence of continued rebuilding, to which the houses were mostly subjected, and the frequently careless laying out of the streets of modern cities, but a relatively small portion of these monuments have remained to us, from which it results that also the well situated merchants and citizens adopted for themselves certain basal traits of the dwellings of the nobles,

and also did not like to reject a certain richness, both in their external appearance as well as in their internal equipment.

In great number appear the city halls as splendid and very impressive evidences of the flourishing and increasing strength of the citizen class in the middle ages. On them is correctly shown to what a height secular architecture had already risen at the beginning of the 15th century. The equipment on the exterior frequently presents choice jewels of Gothic art. (Fig. 191). As a rule they contain in the ground story open halls for assembly and mercantile purposes, in the upper story being the great citizens' or council hall with the offices of the government. Carried to a stately and frequently imposing height, the tower was utilized for the service of the watchmen and was regarded with particular pride by the citizens; it frequently formed the characteristic of their city. Just as interesting are the city porticos, the mints, buildings for weighing and measuring, the great merchants' shops, granaries, exchanges, guild and society houses (Fig. 192), both as monuments in the history of civilization, as a measure of what the different cities, and within them the associations of citizens, required as suitable representations of themselves and of their dignity. Another productive field was found by civic architecture in the fortification of the cities. These could be defended the more easily, the smaller their extent, or the shorter the enclosing walls; therefore the great height of the houses, the narrow alleys and no open squares. The stately gates on which the design and construction intended for defense and also artistic ornament were employed, in combination with the bridges on wide arches and protected by towers chiefly produce the charming and picturesque architectural views of the mediaeval cities. Finally reference should also be made here to the buildings for colleges, which with the advancement in the sciences attained to particular importance. The universities were chiefly derived from the ecclesiastical colleges. The group of buildings erected for them as a rule followed the monastery plan, which favored a suitable grouping of lecture and practice halls around the great court.

As in church architecture, so appear also in secular architecture, in respect to the number, kind, plan and construction of architectural works, many peculiarities, and they characterize the different architectural domains.

In France the most important secular buildings are the castles, mostly destroyed. Representative here was the old Louvre, which must later yield to the new building by Francis I. Judging from ancient miniatures, it was a structure enclosed by strong external walls well defended by towers, symmetrically arranged on an octagonal plan with round angle towers and two round towers projecting from the facade at both sides of the middle elevated window. The few still partially remaining monuments, such as the royal castle at Tarascon, the castles at Poitiers and pierrefonds, and the wing of the castle at Blois named after Louis XII and richly equipped in the interior (Fig. 193), exhibit a far more refined treatment than the contemporary works in Germany. The French castles of the nobles mostly preferred a massive donjon (keep) with strong angle towers (page 67), that was ever more broadly and freely developed, until it was transformed into a court enclosed by internal arcades and surrounded by four wings, which was entered through a vaulted gateway; above this generally was the chapel. Of the city halls is to be mentioned that at Compeigne with high tower (belfry) and graceful angle turrets, to whose type adheres the late Gothic palace of justice in Rouen. (Fig. 194). Likewise the palace of justice at Paris merits consideration, as well as the house of the Abbot of Cluny there, distinguished by an elegant facade. Of the often richly treated private houses, the house of Jacques Coeur in Bourges is a charming example.

In England the castles and the old English noblemen's seats present an interesting and unified representation of the style, among them being prominent those of Westminster, Hampton Court, (Fig. 195), Eltham and Warwick. They preferred the court plan with frequently a very extended development of the facade; and the principal attention was always devoted to the great hall, often extending to the roof and particularly imposing in internal and ornamental respects, over which the richly carved wooden ceiling, generally treated with hammer-beam trusses of bold span, belongs to the splendid pieces of Gothic decoration. (F

(Fig. 141). We have already referred to the world famous colleges (page 115). The entire secular architecture of England bears an entirely native and distinguished stamp by the preference for straight lines and a decided accenting of the verticalism, the windows terminating in lancet, depressed, and later in Tudor arches with mullions like stone tracery, the crowning battlements, charming bay windows, and the splendid forms of gateways, by the broad and spacious halls in the interiors with banded architecture in the wall panelings, the much subdivided vaults or the rich wooden ceilings.

In Germany the Albrechtsburg in Meissen, enthroned in a noble location above the Elbe and protected by massive towers, erected in 1471-1485 by master Arnold of Westphalia, is indeed the best example of the late mediaeval German princes' seats, already tending to a more regular and spacious design. The keep is accessible by a very picturesque stairway tower and is furnished with abundant light by windows ending in shouldered arches. Its rooms were covered by high cellular vaults of stalactite form. (Page 87).

In Hungary the Alt-Sohler castle, built on a hill as a defiant fortress about 1350 is yet in good condition, and also in Switzerland castle Staufis (canton Freiburg), likewise built in the 14th century, which approximates the designs of the keeps of the French models.

Middle Germany has important works of castle architecture to show in the fortress of Coburg, rebuilt after the fire of 1500, whose princely structure is adorned by magnificent decorations in wood, and in the castle at Marburg, that still contains its stately knights' hall, and the castle Stolzenfels in the Rhine province, dating even from the 13th century, and restored in the 19th century. Besides numerous castles remain from the Gothic period in Germany and Austria, even if in great part only in ruins, in largest numbers in the Rhine provinces, the Tyrol and in Bohemia.

To the noblest creations of German secular architecture also belong the city halls. A very impressive monument of this kind stands in a corner of the market place at Brunswick with two wings at right angles to each other, which open toward the marketplace with pointed arcades in the lower story, and in t

the upper with rich tracery windows crowned by tracery gables. Of the old city hall at Nuremberg the great hall still exists. In Frankfort-a-M. the Römer was erected after 1405 with a great imperial hall, whose ceiling dates from the year 1612. The city halls at Breslau, Prague, Ulm, Basle and Cologne are works of the late Gothic period. In contrast to these cut stone buildings, the northern brick Gothic is represented by the city halls in Lübeck, Brandenburg, Tangermünde, Königsburg-I. N. (Fig. 196), Bremen, Hanover and Stralsund. The latter mostly have architectural portions from the most different building periods. Their external architecture lays chief stress on the development of richly subdivided gables adorned by slender turrets. Even with simpler means and in half timber construction, the city halls in the smaller cities were frequently treated in a very pleasing manner. (Halsfeld, Duderstadt).

Notable examples of buildings erected for commercial purposes are given by the Artushof at Danzig (built 1477-1481), erected as an exchange, and the Gürzenich in Cologne (after 1441). The Welsche Hof in Kuttenberg (Bohemia) was begun in the 14th century and is one of the mediaeval mints. Erfurt possesses an interesting monument in its old university, dating from the beginning of the 16th century. In the southwest provinces of Austria on the great structures intended for commerce and traffic, by the numerous trade relations with Venice, powerful influences of Venetian art frequently appeared, for example on the corn-measuring house at Bruck on the Mur. Likewise the citizen's house in cut stone, of the Gothic period frequently exhibits a richer treatment in massive stone construction, like the Nassauer house at Nuremberg and the Krafft house there (Fig. 197) of about 1510, the "stone house" at Frankfort.A.M. (after 1464), the etzweiler house in Cologne, also belonging to the 15th century, and numerous dwellings in Münster-i-W. Brick buildings of this kind are still found in great numbers in the Baltic provinces, in Saxony, Hanover and Brunswick. In southern Germany as well as in the Tyrol and Bohemia, the bay windows (termed "little choir" in Nuremberg), form a favorite and extremely impressive ornament of the facade. (Fig. 198). But in general for all Germany and all middle Europe continues

the half timber construction with stories corbelled out, carved timbers and purlins, and ornamented window enclosures compose the chiefly apparent forms of the citizen's house. (Fig. 199). In its lower story as a rule were located the rooms for business (shops, warehouses, workshops etc.), in the upper stories being the dwelling. The stairways permitting access to the stories enjoyed a soon increasing consideration. Particularly favored were winding stairs, that were often treated in a structurally spirited and artistic manner.

That likewise the buildings for public purposes erected by mediaeval architects attained high technical safety and great utility, and frequently received a monumental treatment, is shown on the white bridge at Raudnitz in Bohemia, built after 1333 by a master William of Avignon, called from France, and on the grand Carls bridge in Prague erected by Peter Parler. (Page 126). Here stands likewise the Altstadt bridge tower and in its vicinity the similarly treated powder tower, begun in 1475; they are splendid representatives of these imposing gateway towers, which remain in extremely great numbers in all Germany, particularly in its brick regions.

In the Netherlands, particularly in their southern portion, secular architecture reached a development, that stands equal to that of church architecture. In no other country has the prosperity and strength of the citizen class found so high a monumental expression as there. In the first rank stand the city halls. As their greatest example appears the city hall at Brussels, founded in the year 1402, a square structure with sides of 196.9 ft. and a tower 334.6 ft. high, which has the name of belfry in the Netherlands. This building was the model for the city hall at Audenarde, erected in 1525-1529. In Louvain Matthias of Layens built the city hall between 1447-1463 in moderate dimensions and without a main tower, but with a richness of architecture and sculpture previously unknown. In Bruges originated in 1376-1387 the city hall, also in modest dimensions. (Fig. 200). The mighty hall tower there even belongs to the 13th century (1283), and rises above the lower structure crowned by battlements to a height of 352.7 ft. Grand is also the city hall at Ghent, whose north building dates from the Gothic period, was begun by Dominicus von Waghemakere

and completed with the most luxuriant Gothic decoration.

But the wealthy commercial cities in Flanders also frequently erected as the most important staple warehouses for the goods brought by the seafaring people from foreign parts of the world vast and often splendidly equipped structures for commercial purposes. The cloth hall at Ypres (now city hall) with a length of facade of 436.7 ft. and a belfry 229.7 ft. high. The cloth halls at Louvain and at Mechlin belong to the 14 th, and that at Ghent to the first half of the 15 th century. With these public buildings compete numerous guild and society halls and even citizen's dwellings as eloquent witnesses of the unbounded wealth of a splendor-loving citizen class exerting itself in great artistic works.

In Italy the development of the Gothic secular architecture does not exhibit that unified appearance, that is generally presented in other countries. The castles erected by the Hohenstaufens in Apulia and Sicily, as for example the castle del Monte and the castle at Buri and that at Gioia are characterized chiefly by their lofty external walls and massive angle towers rising from polygonal outlines as defiant fortresses. The castle Nuovo in Naples, built for the kings of the French house of Anjou, tend more to French models. A tendency toward the picturesque by their grouping and external treatment is shown by the castles in upper Italy at Pavia, Milan and Ferrara. (Fig. 201). The principal domain of Gothic secular architecture beyond the Alps lies in middle and upper Italy, and there chiefly in the independent cities with great power, where the city houses and private palaces compete with each other in beauty. The nobility already from the 11 th century had located its chief residences in the cities, and the ruling families saw clearly then, that if by their active powers they succeeded to the government, it was essential to glorify their strength and to quiet the mass of the people by the erection of imposing palaces and public buildings.

The palaces of the nobles in the cities no longer as in the antique house have the dwelling on the ground floor, but in the first story. The walls of the lower story mostly remain closed or receive only a few small windows, arranged for defe-

defense. thereby the entrances, portals and stairs acquired increasing importance. Battlements for defense crown the facade walls above the slightly projecting arched cornices. Generally corbelling of stories is transferred from wooden construction to stone, so that the walls of the upper stories rest on arches or stone corbels. In Florence the Gothic palaces always produce the impression of fortified stone houses. They have a regular and rectangular ground plan about a small court, surrounded on one or more sides by porticos; the arches that support the heavy walls of the upper stories rise on single and mostly octagonal piers with modest foliage capitals. The externally dry Bargello or palace del Podesta was begun in 1225, and has an extremely picturesque court. On the massive palace Vecchio, rich in historical recollections, erected in 1299-1301 by the cathedral architect Arnolfo, the seat of the signory, i.e. the city government, the fanciful form of the tower is striking. Of the remaining Gothic palaces the palace Quaratesi is still entirely preserved. A noble hall structure was erected in the year 1339 as a grain exchange, but was later transformed into the church Or S. Michele. The loggia del Bigallo (1352-1358; Fig. 202) erected on the cathedral square as a graceful portico for charitable purposes and the proud loggia dei Lanzi built by A. Orcagna (1376-1382) beside the palace Vecchio, in which the signory performed their solemn official transactions, show correctly how strongly the antique tendencies in architecture reacted in the Tuscan Gothic. Likewise on the palace del Comune at Perugia (1340), distinguished by its magnificent portal, is this plainly visible. (Fig. 203). In Piacenza is to be emphasized the stately palace Comunale (begun 1281), opening in its lower story by a massive portico with piers. In Bologna the loggia de' Mercanti, built for commercial traffic in 1382-1384, is counted among the noblest creations of brick Gothic. Extremely rich in secular Gothic buildings is old Siena, where the stately palace Pubblico (1289-1305) with its boldly ascending tower (Fig. 204) and the richly treated palace Buonsignori deserve particular consideration.

A quite independent position is occupied by the old commercial city of Venice. The Venetian palaces do not have that stern appearance of fortified family castles, as in Florence. In

then is expressed the love of splendor of a rich people inclined to a gay enjoyment of life, versed in the world, and which was called forth by an acquaintance with oriental products. The palaces are always symmetrically arranged on a rectangular ground area, have the housekeeping rooms in the lower story, in the upper being a hall occupying the entire depth of the house, which in a certain way affords a substitute for the court, lacking on account of the soil conditions of the city of the lagoons. Their facades are preferably turned toward the grand canal. The continuous series of grouped windows, that light the great hall, and in whose treatment is particularly to be seen rich tracery, produce in combination with the balconies and loggias an extremely prominent ornamentation. (Ca d'Oro, Palaces Pisani (Fig. 205), Giustiani, Foscari). The most magnificent architectural monument of the Venetian Gothic is the Doge's palace, combining at the same time the residence of the prince and the government house. (Fig. 206). The mighty building, commenced after 1310 and first completed in the 15th and 16th centuries, encloses a court treated in the 16th century in the most elegant manner, and it has toward the place S. Marco and the canal two imposing and showy facades. The two lower stories open in airy and graceful arcades, on which rest the external walls of the upper story, rising high, entirely undivided and only opened by some colossal pointed windows, and faced with marble tiles in geometrical patterns - a remarkable reversal of the general architectural principles, since the opening of the walls should occur in the upper stories on account of the heavy load -- but the whole produces an architectural form of wonderful and most highly majestic appearance.

In Spain in the royal palace at Olite (Navarre) are retained the basal principles determinative in French castle architecture. As a particularly rich work appears the palace of the duke of Infantado at Guadalajara (1462) with splendid facade adorned by bay windows and luxuriously treated court, in which Moorish elements are interwoven with Gothic forms. Oriental tendencies make themselves apparent in Spanish castle architecture likewise in the mode of fortification, the subdivision of

the external walls and the architectural treatment, as especially evident on the castle de Coca near Segovia (15 th century; Fig. 207). On the Casa de la Deputacion in Barcelona, begun 1430, that encloses an elegant court, influences from southern France are undeniable. In Valencia (after 1498) Pedro Compte, the architect of the cathedral there, erected the three aisled hall structure of Casa Lonja (exchange) there, which with its magnificent treatment of the portal and the fanciful windows, twisted columns and rich net vaults belongs to the most important works of late Gothic secular architecture.

III. Architecture of the Renaissance. General Basis.

With the end of the 13 th century the Gothic style had reached the limit of its development in France, the land of its origin. Thenceforth several tendencies made themselves felt within it, which opposed its nature, loosened its consistent orderliness and effected a complete dislocation of the principles, from which it originated. The Gothic had penetrated extremely deep and to the innermost marrow of the people. But the absolute rule of tradition required by it could only be maintained as long as this was entirely filled with the mediæval spirit; it must fail at the epoch, in which different conceptions of the world and its phenomena appeared and men strove for new ideals. We could observe in the entire course of late Gothic, how with the influence of the common and practical sense of the citizens in church architecture and in a still higher degree in secular architecture, the respect for the strict principles of the style gradually disappeared from the minds of the people. And when finally new and real requirements entered the foreground, then the Gothic style, once carried to such a rich climax, showed itself unfruitful, entirely exhausted and capable of no further development. Thus appears to us in the entire 15 th century, even where Gothic remained in its supremacy in France, Spain and Germany, in spite of numerous flowers still rising from the withering branches, there is yet merely a continued life in its deeply rooted trunk, a final wasting of the remains of the strength within it, a slow dying of mediæval art.

At the same time proceeded from Italy the light of a new life. For after a long period of decadence, in the second half of the 13 th century, there came a time of florescence for the sunny land south of the Alps, in the course of which the sciences in combination with the formative arts attained to a splendid development. On its soil, always swept by a slight wind of pagan antiquity, the Gothic middle ages had but partially prevailed in certain definite regions, and even there frequently only by giving up its most important principles. There also broke out fully then that mighty movement, which overthrew

the entire mediaeval system and introduced a new and completely changed period.

If one seeks the impelling forces of this movement, we first find the feeling for nature again aroused in all the nations of the West and even becoming stronger after the middle of the 13th century, which stood in abrupt contrast to the gloomy and world-renouncing spirit of the middle ages. After Petrarch (1304-1374) had described the beauty of the world with such glowing inspiration, the joy in nature became general. A previously unknown impulse toward a knowledge of its phenomena and their causes, a formal thirst for knowledge possessed all minds. Opposed to it the old scholasticism sank into a nonentity.

Extremely forcible in the evolution of the conditions of the time was further the effect of the unusual importance, that individualism secured in the people generally, indeed both in intellectual and political, as well as in artistic domains. Great and powerful personalities, coryphees, such as no second period of the history of civilization and of the minds of mankind has to show in such serried ranks, appeared on the scene. By them were broken the restraining fetters of the rigid mediaeval compulsory dogmas. Free activity in intellectual and political life was the first and most important requirement, with which the largest classes of the people agreed. A democratic and entirely realistic basal tendency dominated the multitude. It was unavoidable, that the Christian idea thereby lost its importance, and the influence of the church diminished. In increasing measure the chief attention of public life was devoted to secular interests.

There the thoughts of classic antiquity, chiefly produced by learned study, found willing acceptance and brought a new impulse, highly characteristic of the change in views, very important for the further development of the conditions of the time. Men saw in the peoples of antiquity, whose works expressed such a serene and secular character, frequently the ideal of the most perfect earthly felicity; their literature, mythology and art continually enjoyed a warmer reception. Comparisons were drawn between the architecture of the ancients and that of the

middle ages, and men finally reached the conclusion, after recognizing the high formal superiority of the former, that this was ever the unattained and the undying ideal of artistic expression; therefore the revival of the antique, which contained the most dignified and most elevated forms of all, was what a art must everywhere strive for, forming the highest aim for a all artists of the later time. -- In the second half of the 14 th century Petrarch and Boccaccio, the greatest poets of Italy's best period, demanded as first and most important the a adhesion to the antique. This idea acted on the artists like a greater illumination. In the first half of the 15 th century it became a fact. Thus after centuries of strife between the traditions of the fallen Roman empire and the Gothic elements coming from the North and not capable of assimilation in Italy, men came to the conclusion, exceedingly important to t the history of civilization, to adopt the Roman architectural forms as a means of expression for the new requirements in the intellectual and material domain, changed from those formerly common. It was an occurrence unequalled in the history of the world, that an art was awakened into new life after being dropped for a thousand years.

The new epoch in art and science thereby introduced, already in the 16 th century had received the name of Renaissance (from the Italian rinascimento = rebirth), although this appellation in nowise exhausts the signification. For the antique is not the deciding but the concurring factor. It was also actually in the new movement not treated as a "rebirth" in the sense here conceived, but as the transition to a new view of the world. It was an entirely new spirit derived from naturalism and individualism, renouncing the middle ages, and which saw in the versatile balanced beauty and maturity of classical antiquity the ideal of a harmonious and humane con eption of life, regarded its language and literature as an inexhaustible source for the ethical and intellectual education of the human race, and founded that humanism, on which rests all modern civilization.

Certainly the artists conceived a revival of the antique, e entirely aside from the realm of architecture. With greater

spirit were studied the remains of buildings from the classical period, then preserved in abundant measure. However in them were found but few models corresponding to the architectural problems of the new period. The art of interiors had meanwhile been gone over by the elevated school of the middle ages, by whose architectural system and technical methods men had learned to master the most difficult problems. The antique offered to the Renaissance suitable precedents, less for the treatment of interiors, than for the forms of facades. Yet in regard to these, they were limited to the Roman theatre, the architecture of triumphal arches, and the Septizonium of Severus (see volume 1), still remaining at that time. Men could not employ the system on which these were based, but only the method of treating the forms of the details. Even in the creation of the interiors the Renaissance pursued its own course, likewise one not previously one indicated by the middle ages. The Gothic had developed its structural system exclusively in church architecture; in the treatment of interiors for convenient inhabitation or for secular festal receptions, it participated only in very slight measure. There the Renaissance appeared in order to propose a splendid programme for the "art of the mode of life." It created an internal style, whose conditions for the beauty of an interior and of its members became an ideal principle of construction of permanent value. Its creations of interiors produced by the new spirit of the time clothed the Renaissance in the detail forms of the antique; therein lies the importance and the share of classical architecture in its evolution.

It was unavoidable under these circumstances, that the architectural treatment should rise to a harmonious and perfect organism, particularly in the hands of few important masters, while the different members do not express the functions served by them, in the manner which we have learned to recognize in a study of the Grecian columns and their orders (volume 1, pages 62-75). Only in the stadium, in which the Roman artists chiefly learned to recognize the antique (on the monuments of the alexandrine period and that of Roman art), the architectural members had already lost that purity, that was peculiar to

them in the best Gothic period; they had become ductile and flexible and thus far more suitable for adoption in Renaissance architecture, than in the severe forms of the Grecian conception.

But the masters of the Renaissance did not fall into direct imitation of classical architectural forms, at least not in the early and best periods; they adopted the elements, transformed by their own feeling for style, and then applied them to their works in a new conception. With the expressed joy in nature and the strong and frequently direct accenting of the individual, they appeared as if directly opposed to the antique, even in the aim directed toward pure beauty of form. And therefore the art of the Renaissance no longer flourished as in antiquity in a unified tendency of the style; there arose different art currents, which were often carried on in their magnitude for a century by prominent leading masters. Thereby the history of art became a history of artists; the personal worship of fame in antiquity reappeared in the foreground.

For the free evolution of the great individuality of artists at the end of the middle ages, Italy and Germany offered the widest space; therefore in those countries the Renaissance bore the richest fruits; France, England and Spain afforded by their strong centralization a less favorable soil for the evolution of personal peculiarities than Germany, where the political subdivision set less restricted bounds to the occurrence and continuance of artistic individuality. But the main land of the Renaissance is Italy. It there appears as a direct expression of the spirit of the people in the forms of the antique, which was never entirely suppressed on Italian soil and even conquered the Gothic, when it compelled this to subordinate its basal principles; it rose there to that artistic elevation, which lent to it a universal importance for the entire architectural art of succeeding times.

1. Architecture of the Renaissance in Italy.

1. Historical Evolution.

Italian Renaissance architecture appeared with a great artistic work of the first rank, with the design and erection of the dome of the cathedral of Florence. It was no accident th-

that Florence, the beautiful Tuscan capital on the Arno should become the birthplace of the Renaissance. There at the beginning of the 15 th century the interest in art had penetrated into all classes of the population, favored by a refined course of life, that elevated political and social conditions. The works of the artists attracted popular attention; in the full entirety, these took part in the high ascent of the intellectual culture of that time. In the animated sense of the Florentines, particularly receptive for novelties, was aroused a sense of their own power, an elevated feeling, that pressed forward to great artistic deeds. The opportunity for this was presented to them by the cathedral. (See page 136). Already during the entire 14 th century the citizen class had busied itself in its progress in an unknown measure; ever again were new and grander architectural ideas brought forward, competitions among artists were established, and commissions of architects and painters with many members were formed with the command to undertake something unknown. In the year 1420 the building had so far progressed, that ~~the erection of the dome~~ could begin, which Arnolfo had included in his design, even if in much more modest dimensions. But the vaulting of an interior of such a colossal span (137.8 ft.) appeared to the masters of the cathedral as a hazard, for which none among them could decide. Then Filippo Brunelleschi, a gifted, learned and many-sided man, an artist previously chiefly active as an engineer, goldsmith and sculptor, presented a design with statical explanations, on the basis of which he was appointed master of the building of the Cathedral, and was entrusted with the execution of the dome according to his plans. After 1417 Brunelleschi had undertaken thorough preparatory studies of antique structures; in 1420 he commenced the vaulting on the already existing drum, indeed as a cloister vault with strong ribs rising from the angles of the polygon, with thin vault shells built between these as the internal dome, and an external higher protecting dome built in the same manner, that was connected with the internal dome by intermediate arches. In the year 1434 was the dome completed in its most essential parts by the addition of the heavy crowning ring to receive the ribs of

the vault. At the same time was adopted the master's model for the lantern, a small addition loading the upper ring and admitting a high side light. Its erection first commenced in 1445, shortly before the master's death; it was completed in 1467. (Fig. 208).

The cathedral dome of Florence has less importance as a style-forming monument, than as the earliest work of that master, of high importance chiefly in structural respects, which as the first after a zealous study of the ruins of Rome was called into life with the aim for the architectural forms of antiquity. Brunelleschi was there entirely restricted to the Gothic substructure; its dome stands organically on that. And yet the same breathes the spirit of the new time. Therefore it also became the actual creative building of the Renaissance.

176 The succeeding evolution of the Italian Renaissance architecture was completed in three periods, which exhibit the growth, flourishing, and the decadence of the style.

1. The early Renaissance from 1420 to 1500. * This is the period of transition and of search for the new forms of the style. Its chief region is Florence, where beside and after Brunelleschi, masters of genius, such as Michelozzo, Alberti, Rossellino, Cronaca and others developed an extremely fruitful activity. We shall learn to know their works later. They present to us particularly in the first period tentative and still uncertain proportions of the architectural masses after antique principles, and in the treatment of details a very reserved tendency toward the architecture of the ancients without any deeper insight into the conditions on which it was based, and especially without an understanding of the more refined relations of the members to each other. On the other hand there is in the rich and naturalistic decoration a freshness and charm, which give to the works of the early Renaissance a peculiar and almost youthful grace.

* The Italians designate this period as "Quattrocento", i.e. the time from 1400 to 1500, and the high and late Renaissance, as "Cinquecento", i.e., the time from 1500 to 1600.

2. The high Renaissance from 1500 to 1540. The art of the 15th century advanced with colossal strides; with the beginning of the 16th it entered a new phase. It had then learned

how to solve the most difficult problems, to perfect technical methods to the extreme, to make the classical treatment of forms its own, and to dray all arts in the richest measure into the service of architecture. The impulsive pressure of life peculiar to the entire period was contemporary with a mighty tendency toward greatness. In the entire architecture was expressed a feeling of the masters and architects directed to the monumental.

With the entrance of the high Renaissance the centre of gravity of artistic evolution was transferred to Rome. After the middle of the 15 th century the eternal city had continually won greater importance, and had drawn leading artists to itself. After the powerful and art-inspired Pope Julius II had ascended the chair of S. Peter (1503), he called the greatest masters of the new art to his court, and then arose on the ruins of the ancient world a magnificent city, in which was visibly renewed the former splendor of the Roman emperors. Italy entered on an unequalled climax, into its golden age. Artists with incomparable gifts and creative power developed before the astonished world their epoch-making activities. This was the age of Bramante, Raphael, and Michelangelo. Both in palace as well as in church architecture did they complete the grandest works. - - Not long, scarcely a half century did this climax of the Renaissance last. Already before the end of the first half of the 16 th century, it passed over into:--

3. Late Renaissance. This falls in the time from 1540 to 1580. The freedom in which the great artist natures could move, which in a directly unlimited manner dominated the interior and the material and brought them into a harmonious organism, was a danger for their less important successors in a period, that required from the architects the extraordinary and the unusual; they inclined toward that intended heightening of the artistic means of expression, in which we recognize the first symptoms of the Barocco style. But there still prevailed, at least in general and for the next period, the high sense of beauty derived from the works of the great Bramante; it entitles that group of masters with refined feeling to permanent fame, who recognized the sources of beauty in the internal

truth of the architectural works and of their organism, and in regard to the treatment of the forms in definite proportions, since they sought to investigate these and thus create principles of style, that in fact and in writing should be esteemed as ever applicable standards of genuine artistic treatment. These are the great theorists, Vignola, Serlio and Palladio, who then developed their rich abilities, sometimes in Rome and in the more important cities of middle and upper Italy. Likewise for these was determined in a still higher degree than previously the spaciousness required by the owners. They are also spirited and original in their works, even if the free artistic feeling then prevails less than the calculating and combining understanding. The antique stands nearer them than their predecessors. With great earnestness the architectural works of the ancients were by them investigated anew, measured by stories and by orders, and from the results were established in a certain way for proportional dimensions of all separate members. Thereby architecture assumed a predominating academic character. Vitruvius' works (see volume 1, page 134) again received a thorough study. More than previously was the attention devoted to the architectural treatment. The ornamental decorative work, which played a part in the early style nearly equal to the structural, but which in the high Renaissance appeared in a harmonious but subordinate relation, indeed retained its purity, but showed a cool and almost indifferent reserve. * Thus the buildings received an indeed dignified, but frequently stiff and aristocratic appearance, that is particularly expressed in palace architecture and there presents a reflection of that grandeur (grandezza), that proceeded from Spain, and dominated in increasing measure the society there. About the end of the century the detail sinks to an entirely capriciously treated portion of the whole; the transition to the Barocco style is completed. * *

** In the decadence of the enjoyment in ornamental decorative work is expressed a lessening of the national in the architecture of the Renaissance. The humanistic movement originating with it brought a division of human society into cultured and uncultured. The architecture also therefore acquired in its*

further course a predominating courtly character.

** * Indeed strictly taken, the Renaissance does not thereby come to its end. The Barocco style and its successor the Rocco properly form the last phase of its development. Yet their origin and development, particularly in northern countries, results from so many new impulses and views, that we shall consider these in a special Chapter.*

175 II. The Structural System and Technical Methods.

With the revival of classical antiquity the antique structural system again came into use, that in contrast to that of the resolution of the masses and of upward movement followed by the Gothic, sought esthetic satisfaction in the rhythm of the predominating horizontal architectural masses and the equilibrium and uniformity of their bearing and supported members. Thereby the basal principles expressed in the columnar orders and their entablatures became predominant in construction. Thus the Renaissance invented no new structural system; but it performed an act of the greatest importance, when it did not restrict itself to the technics of the ancients, but in order to construct rationally in all respects, employed all systems of construction according to need. It thereby introduced a permanent basal idea into the art of the interior, since it held itself entirely free from structural restraints, so far as esthetic harmony permitted this.

With the same freedom it proceeded in the selection of its building materials and their technical treatment and employment. For the walls, ceilings, roofs and decorations, it employed the same materials as the preceding art periods. Only iron passed into use in greater abundance, yet not as an independent structural material in the present sense, but as an aiding material for stone and wooden structures, particularly in the form of anchors and ties for arch stresses. The antique had avoided as far as possible such visible means of construction, that must produce reflections on their permanence; the Renaissance made abundant use of them, not only in arched passages but even in great halls and churches. The walls consist of a masonry nucleus, either of rubble or brickwork executed with asphalt or lime mortar, in which the openings for light

and the supporting points are omitted for the finally applied facing with ashlar. In the dressing of the latter the Renaissance shows itself very fertile on the side of form. Before it ashlar mostly had smooth external surfaces. But besides these, ashlar with bosses and drafted margins were common in antiquity among the Greeks, Etruscans, Romans, and in the Romanesque period, particularly in fortifications, combined with smooth stones having ornamental chiseling, and in the Romanesque period was common the moulded border with smooth boss. The Renaissance adopted anew these modes of cutting ashlar as a very important decorative means for animating wall surfaces; these were richly treated in the form of square or rectangular diamond ashlar and those with flat raised bosses, and these were either used uniformly over the entire facades, or with a certain graduation, so that bold and irregular bosses were arranged for the lower story, for the second a regular jointing with flatter ashlar, with entirely plane ashlar or smooth coursed masonry in the upper story. (Fig. 209). From the irregular and dry treatment with bosses this method received the name of rustication, that was also transferred to ashlar with more careful treatment of the faces. The rustic work presents "a representation of rude strength in alliance with the arranging and creative spirit of man". -- Besides this masonry with a facing of natural stones, there is also such with bricks left visible, these being frequently stained red with white joints, usually as a covering of the wall between the cut stone architecture, frequently in combination with plastered and painted green surfaces, also by a network pattern of red and yellow stones. This mode of decoration was translated into nobler stone for particularly dignified constructions, and thus into facings with slabs of marble in surface patterns of different colors, a procedure that greatly flourished, especially among the Venetians. Greater favor was already enjoyed in the early period by terra cotta, both in natural colors as well as with variously colored glazes, and indeed for architectural enclosures as well as for purely ornamental decorations. If inferior and unequal materials were employed for the walls, a protective coating of lime plaster was given to them, to which was sometimes given an artistic effect by the sgraffito to be

described later. A building material very flexible for relief decoration was thus secured in stucco (see volume 1, page 76), of which excessive use was made, especially by the late Renaissance.

Wood takes but a modest part in the external constructions of Italian art; it is chiefly limited to the strongly projecting (up to 6.56 ft.) roofs, which are artistically treated as a wooden cornice with console-like ends of purlins and rafters. The Florentine and Pisan palaces acquired by this a very effective termination of the facade.

For the roof construction as a rule was chosen a low purlin roof covered by tiles on metal plates, more rarely (in Genoa) with slates, and for slight inclinations, stone slabs.

172 The internal ceilings were constructed either in wood as horizontal layers of beams and ceiled beneath, or solidly in stone as vaults. For the latter the cross vault continues in use; but the ribs of mediaeval form are only retained in the early Renaissance; later the cross vault occurs almost always in the Roman form without ribs, the groins diminishing upwards towards the vertex. The tunnel vault came into more common use again, as a rule being subdivided by dropped arches and coffered after the antique form. Over winding stairways it becomes the annular vault. A new form was introduced by the Renaissance in the coved and panel vaults, which were preferably employed over corridors, vestibules, stairways and festal halls. They rested on the impost cornice crowning the walls as a broad cavetto, above which the middle panel (mirror) extended as a very flat vault. The panel received a gold frame run in stucco, in geometrical lines in the Renaissance, later in curved ones. This sort of vaulting proved especially favorable, since it required but little height and presented large undivided surfaces for the representation of relief and picturesque figure compositions. The execution followed with tiles laid flat in excellent stone and mortar; it placed great demands on the skill of the workmen. For great spans men preferred the sham vault already recommended by Vitruvius, built of wood with laths or board sheathing and a coating of reeds and plaster. Strong vault thrusts, when no tie rods were arranged, were fre-

frequently opposed by a corresponding strengthening of the walls by buttresses, which then extended **their** entire height with the same thickness, with **cornices** broken around them and airy caps **like** tabernacles instead of finials.

Dome construction received a greater development. Models for this were afforded both by the examples given by the Romans (in the Pantheon and the temple of Minerva Medica; volume 1, pages 135, 139) with circular or polygonal substructures, and also by the Byzantine system, which transferred the square ground form, by means of pendentives (volume 1, Fig. 178) in the form of spherical triangles or trapezoids, to the base ring of the dome, above the **cornice** of which rose the dome. Smaller domes were mostly built solid and were not rarely covered by a pyramidal roof, larger ones being erected in two shells (after the model of the dome of the cathedral of Florence, page 171), the external one chiefly having the purpose of protecting the internal one from the injurious effects of the weather. Therefore the great domes became comparatively light, but by the proper stiffening of both shells secured nearly the resistance of solid construction. The grandest dome construction of the Renaissance is represented by the dome of S. Peter at Rome. Michelangelo had arranged iron anchors in the drum in his model and iron rings in the dome, which were later increased (now five in all). For a third of the height both domes are built solid as one; then they separate into a thick internal dome and an external dome, which consists of a thin shell extending between strongly projecting ribs and covered with lead. (Fig. 210). In the hollow space between the two domes double winding stairways lead up to the lantern, then down again to the main cornice of the inner dome. Only by these stairways are the two domes connected together. With the vast internal diameter of 139.8 ft. (i.e., 39.4 ft. more than in S. Sophia), the dome of S. Peter's rests on a drum extended high above the roof of the colossal building at a height of 264.4 ft. and thus attains to the height of 404.9 ft. to the eye above the pavement. Thus aside from the perfectly harmonious control of the material and its architectural subdivision, it appears as the grandest structural work, that the history of

architecture has to exhibit anywhere.

III. The Architectural Treatment.

Still more decidedly and expressively than in the construction did the Renaissance apply itself to the architecture and decoration of the antique. It was then unavoidable, that at first only the most striking adoptions again found employment, frequently without organic propriety. The mediaeval arrangement of the ground plan and proportions of the mass of the structure yet continued for a longer time. To the facades were given a plinth as a base and a crowning main cornice, the wall surface lying between them having a subdivision into stories by belts. The wall surface was suppressed in the Gothic as much as possible, but again entered into its rights as such a and was strongly accented by rustication. The profiles of the belt and main cornices still show a very uncertain handling in the first time; it finds the beautiful more by an unconscious feeling of tact, than by a knowledge of the system. It is also at first less the correct and strong forms, than the happy distribution and the mass relations of the doorways and windows with their enclosures and the expressive development of the wall surfaces themselves, which carry in themselves the new elements of beautiful forms. To these are further added niches, balconies, bay windows, loggias, and at about the end of the early Renaissance, the entire antique system of pilasters and columns with its orders for the supports and entablatures, and furthermore already at the beginning of the Renaissance, an extremely rich decoration by relief and painted ornament.

The plinth in the early time chiefly consisted of slabs without mouldings and set on edge, in Florence of a low stone bench; in the high Renaissance, it was divided into three parts, after the model of the antique pedestal of a column. (Volume 1, page 126). The belts in the Florentine Renaissance were all continuous window sill belts with the profiling of the antique impost cornice; later they were lowered to the levels of the floors of the different stories, then receiving bolder forms with a tendency to the antique belt cornice. If bricks were employed for this, then slight projections were given to them,

but richer ornamentation. In cities with increasing population one also meets with projections of the upper stories on round arches with consoles or directly on stone consoles, even if far less commonly than in the North.

As a rule the main cornice adheres closely to the Roman modillion cornice (Compare volume 1, Fig. 181; volume 2, Fig. 211), but it was also freely treated in wooden construction with plastering on reeds, as a great cavetto in combination with round arches and colored decoration, thus forming an extremely magnificent crown to the facade.

The portals in the Florentine early Renaissance have a semi-circular top with a wide moulded enclosure. (Fig. 209). In Lombardy they are quite early enclosed by pilasters and even by candelabra -- columns with antique entablatures and rich ornamental work. (Figs. 212, 261). Instead of pilasters sometimes occur in Genoa, Umbria and Rome half, three-quarter and full columns (Fig. 213), as well as double columns with figures and pediment or segmental caps, and also finally with projecting columns, hermes or caryatids as supports for the balcony projecting above them. In the form and treatment of the window at first there still reacts the mediaeval tradition. They ended in round arches, frequently coupled by the insertion of a middle column. (Figs. 215, 250). The profiling of the enclosure generally follows the antique architrave. In the high and late Renaissance the window chiefly assumes the form of a vertical rectangle. It is then preferred to crown it by a frieze and cap (Fig. 216, 173), whereby these frequently rest on consoles. (Fig. 263). With a richer treatment of window enclosure forms an independent architecture of pilasters and columns with a parapet like a pedestal and an antique entablature, on which rests also a pediment or arched cap (see windows in Figs. 151, 157). As in late Roman art, likewise in the Renaissance, niches with round arched tops, frequently decorated by a shell (Figs. 251, 222, 268), became a favorite motive for animating wall surfaces and for the reception of statues. Balconies were not limited to a single window (Fig. 216), but frequently extended along an entire facade. (Fig. 252). If the face of the story above them be not set back, they were composed of projecting stone slabs on consoles and furnished

with a railing, whose rail was at first supported by decorated slabs or little columns, but at about the end of the 15th century by balusters, a form of small free support exclusively belonging to the Renaissance, that indeed recalls the antique form of the candelabra, but is here quite differently employed. Bay windows likewise occur in the Italian Renaissance, even if less commonly than in northern art. They appear in the South more as covered balconies. But so much the more common are loggias, which already in mediaeval Venice form a design characteristic for the art of the city of the lagoons, and may well from thence have found the way to the remainder of Italy.

182 They afford protection from sun and rain, give space for a greater number of persons, and thus so properly correspond to the Italian climate. The high and late Renaissance again adopted a motive introduced from the antique, the attic (volume 1, page 107); this frequently increased to a separate low story provided with small windows (Fig. 236), and it occurs in combination with balustrade terminations and figure decorations. (Fig. 232). The pediment first came into more extended employment in the late Renaissance, yet more in church than in secular architecture. Villas and the better class of dwellings often received above the roof an addition like a portico, termed loggetta or belvedere, on piers or columns with architraves and a low hip roof.

Facade architecture attained a grander development about the end of the early Renaissance and in the high and late Renaissance by the adoption of the antique system of pilasters and columns in all external architecture. Nearly all the more important masters investigated the "orders of columns" of the ancients and fixed their proportions. Already the learned Alberti wrote a treatise, in which he fully expressed himself in regard to the columnar orders; the theorists Vignola, Scamozzi and Palladio did this later in a far stricter sense. They took the system for on the Roman monuments for the Tuscan, Doric, Ionic, Corinthian and Composite orders (volume 1, page 108 et seq.) without substantial alternations, and thereby established a canon for the monumental treatment of facades, which remained in force until the most recent times. Figs. 217,

243, 259, 262, 273 and 275 exhibit how, though somewhat ~~uncon-~~
~~strained~~ in conception from the beginning, the mature style gr-
 adually developed.

53 The Renaissance worked out an endless variety in the forms
 of details. By an extremely capricious fusion of Ionic and Co-
 rinthian forms and the intertwining of conventionalized and n
 naturalistic foliage with emblems, animal forms and figures,
 were produced new capitals for columns and pilasters in lavish
 abundance. (Figs. 218, 219). The shafts of the columns were
 richly ornamented by flutes, cabled or plain, by small figures
 and festoons on the lower third, and even with ornamental work
 covering their entire height (Fig. 220), and likewise the pil-
 asters had vertical bands of scroll ornaments in sunken panels
 (arabesques; Fig. 222). With equal luxuriance were decorated
 the entablatures, the arch spandrels and even the pedestals of
 the columns. The early Renaissance shows itself in this resp-
 ect more tolerant ~~and~~ fertile than the developed style, by w
 which certain limits were placed for purely ornamental art for
 the benefit of the predominant architectural effect. Beside
 the columns, piers with square, rectangular and octagonal sec-
 tions, can~~o~~elabra-columns, particularly in upper Italy, hermes
 (i.e. busts with supporting piers diminishing downwards, Fig.
 274), as well as caryatids and atlantes (volume 1, pages 70, 82)
 found employment as free supports or as those attached to the
 walls. But the latter do not, as in the antique, have an ind-
 124ifferent pose, but as the supports of the balconies and ceili-
 ngs, they oppose themselves with visible expression against t
 the loads resting on them. Since the great architects of the
 Renaissance were also sculpturs and also mostly painters, they
 had relief and painting at command, and they placed these in
 the richest measure in the service of architecture.

IV. Internal Architecture and Decoration.

Like the antique in its time, the Renaissance transferrred
 in a similar manner the architectural system developed on the
 facades also to the internal architecture, so far as this cor-
 responded to the intended purpose of the room. But in this
 church buildings did not come into consideration, or at least
 not chiefly. As a genuine "art of living", their attention

was devoted in equal measure to the palace of the noble and even to the dwelling of the well to do citizen, in order also to give to it convenience, comfort and artistic beauty. Thus the great halls, reception and living rooms were then treated as impressively as possible, and not only these, but also the entrances to them. Since the state and living rooms were no longer on the ground level, as in the antique house, but lay in the upper story, the construction of the stairways rose to great importance. In these the Renaissance created new architectural types almost without models. The narrow winding stairways of the middle ages were only retained for the servants' and subordinate rooms. For the main stairways were chosen straight flights of stairs with resting places (levels), convenient and low steps. The early Renaissance chiefly placed them in one of the porticos surrounding the court (Fig. 185). But the high Renaissance and yet more the late Renaissance erected spacious and inserted stairways as imposing show porticos in the great style, treated with costly materials, excellent sculptures and rich paintings on the walls and ceilings.

165 The floors, in case they were laid on masonry ceilings (vaults), consisted of simple structures of terrazzo (i.e. bits of stone rolled into a layer of cement, rubbed down and polished), in richer ones of glazed clay tiles, marble slabs and mosaics; over wooden ceilings were adopted a simple board covering or a parquetry floor.

With extreme richness and variety were the walls decorated. On them the great sculptors and painters, working together, frequently produced results of the highest artistic worth. With execution in relief the architectural subdivision of the wall was always treated according to the antique principle with plinth, a row of pilasters, whose cornices and panels enclosed in the intervals formed the basis. The members, frieze and panels received a rich relief for painted ornamentation, whose charm was based on the refined graduation of the architecture and ornament, and the pleasing treatment of the details. (Fig. 222). Likewise in exclusively painted decoration the conception is chiefly architectural (Fig. 223); plinth, pilasters, frieze and cornice were still painted in simple colors

in the 15 th century (gray on gray or brown on brown), but latter is varied treatment. Instead of a facing with the nobler kinds of stone or with stucco usually appeared wooden paneling, either in almost the entire height of the walls, so that above the cornice only remained space for a painted frieze as the upper termination of the wall, or as a high parapet. In secular buildings the walls in rooms serving less for state purposes were almost entirely hung with fabrics, stamped leather and woven fabrics, and finally were covered by painted or printed papers. As special show pieces were the mantles treated. They had an architectural construction with pilasters or columns, sometimes also with atlantes as supports of the cornice and crowned by caps like pediments or by coats of arms in relief.

If the ceilings consisted of horizontal layers of beams, they were treated as coffered ceilings, either by a ceiling on the beams and the placing of bands, or by timbers inserted between the beams and correspondingly covered by paneling and mouldings. Prototypes for these existed in the portico ceilings of the antique, (Volume 1, page 65), and in the coffers of Roman vaults. (Volume 1, page 113). In the Renaissance these ceilings were frequently enclosed by rich carved work, painting and gilding to transcendent splendor. The panels (coffers) were originally square, later hexagonal and octagonal with triangles lying between them etc., and shaped in star forms. In the late Renaissance (first in the Doge's palace at Venice, after 1500) the uniform division into coffers was abandoned in favor of a large middle panel enclosed by a wide gilded frame, and containing figure compositions of the grand style in naturalistic colors on the background. By these the design of the interior was elevated, and the impression was created, that the ceiling was perforated, permitting a view of ideal architecture and landscapes, variously colored figure groups and the like. In well calculated graduation then the paintings of the subordinate panels are kept in a single color (in brown, gray or a bronze tint). Likewise on the vaulted ceilings of about the same time are omitted the originally prevailing coffers in favor of a similar division of the surfaces of the vaults into panels, in which painting finds space for earnest historical

representations, as well as for the development of rich ornamental magnificence.

87 To the ornamental arts fell an infinitely greater importance than as in the middle ages. The enjoyment of ornamental work had become more intensive and general. With spirited recognition were pursued the works of sculpture, of painting, and of the minor arts; they were then prized more for merely esthetic enjoyment than as mental representations, though pleasing to the eye. Thus figures and scenes from the ancient myths reappear as favorite motives and even penetrate into consecrated places. The high nobility of form of the antique art became again the chosen ideal of the Renaissance master. Yet formal beauty indicates only one basis of their artistic creation, indeed not one of the most important. The aim of the Renaissance lies in an expressed realism, which instead of general types sought to present a picture of the actual world with the diversity of individuals by the strongly emphasized expression of character and impulse in the face, figure, movement and clothing, with the entire surroundings in space in complete truth to life. Therefore sculpture in relief produces a representation of the figures with architectural and landscape backgrounds viewed in perspective (Fig. 225), and it sometimes even takes into its service the sister art (by painting and gilding the whole or certain parts). This fresh conception of nature is especially peculiar to the works of the Quattrocento. In the high and late Renaissance occurs -- in relief more than in painting -- among the conscious antique tendencies, the generalized endeavor for purely formal beauty again becomes stronger in the foreground.

88 Monumental sculpture received its chief problem in the production of figure decorations by statues and reliefs for facades (on portals, in niches, as crowning roofs), in the internal architecture of churches (on altars, pulpits, tombs and the like) and of palaces (on stairways and on mantles in the great halls). The minor reliefs were applied to the rich decorative ornamental work. Its conventional development proceeded according to the tendencies mentioned above. All technical methods were included in the domain of activity; sculptures in nob-

noble and common stones, in stucco, bronze, terra cotta and wood. Sculpture in stone and in stucco became general, the first chiefly in external architecture, the latter (after the middle of the 15 th century) came into use in the internal ornamentation. casting in bronze reached high perfection. Already with the beginning of the early Renaissance, the Florentine Ghiberti, a contemporary of Brunelleschi, had created in the eastern bronze doors for the baptistery at Florence one of the most famous masterworks of sculpture. (Fig. 225. *). Terra cotta, likewise by a Florentine master of the Quattrocento, Luca della Robbia, was elevated to a new species of sculpture, when he produced his figure reliefs in medallion form in colored glazed clay in an ideal beauty of treatment of form and color. An important place was further taken in the Renaissance by decoration in wood, both in a purely architectural use (supports, cornices, frame enclosures etc.), as well as in wood carvings. Their execution occurred partly in the round, partly in high and low relief, or lying entirely flat in the surface as inlaid work, or as intarsias (marquetry). This technical procedure was already proved in antiquity; it was again revived in the middle ages and reached the highest perfection in the early Renaissance. The method of execution consisted in laying thin veneers of different woods ~~on~~ each other, ivory, mother of pearl and metals, then sawing them out at the same time, properly interchanging them, glueing and laying them. The drawings still consisted of geometrical ~~patterns~~ in the middle ages, almost always in black and white, but after the beginning of the 15 th century were ornaments, architectural perspectives, landscapes, and even representations of figures.

* These doors contained in 10 panels figure reliefs, which represent scenes from the Old Testament, from the creation of man onwards. Michelangelo was so enraptured by their beauty, that he said, that they could stand at the gates of paradise.

To monumental painting fell the rich colored ornamentation on ceilings and walls. In the 15 th century it chiefly sought to imitate architecture by a colored coffering of the vault compartments and architectural perspectives with garlands etc.

on the wall surfaces. The larger mural paintings were enclosed by bands of ornament, that are again interrupted by smaller paintings contained within circles and polygons like medallions. In this manner the meaning of the great paintings was brought into harmony. As the technical method, fresco (volume 1, page 125) almost exclusively came into use, which showed itself to be very suitable and durable for the internal architecture. Likewise on the facades the enjoyment of artistic decoration frequently no longer left free the plastered surfaces between windows and cornices; they were then covered by ornamental or figure paintings in fresco or in the more durable sgraffito. In the latter case the wall surface first received a dark (mostly black) background, then a thin white or light yellow coating over this, in which by means of properly shaped points and scrapers, the design was produced by removing the coating in lines or spots. Thus had been obtained a facade painting, which was as durable as even the plastering itself. Likewise *chiascuro* ("light-dark") frequently came into use, a painting with but one color on the wet plaster ground.

17) About the end of the 15th century, suggested by the discovery of the Baths of Titus in Rome (volume 1, page 114), was perfected a great transformation in the decoration and indeed chiefly in the ornamentation of the internal walls and ceilings. In a variegated alternation and combination of stucco with painting were interwoven, starting from the antique prototypes of "grotesques", ornamental motives of all kinds, human and animal forms, fabulous beings, implements of technics, art and science, fanciful architecture, events from mythology, poetry and history, also landscapes, often enclosed as small pictures within delicate frames of stucco, with ornamental work, especially acanthus scrolls, garlands of fruits and foliage, bands and knots. The most charming forms and colors were thus enchanting in a blooming and inexhaustible artistic imagination, which combined the separate pictures into a rapturous play on the walls and ceilings, controlled by the most refined feeling for a cheerful and ornamental effect. All details were executed in perfectly graceful drawings; the whole covers the shafts of the main and subordinate pilasters and their bands,

as well as the enclosures of the parts of wall and ceiling in an entirely flat character, so that these decorations join in the general effect. By this method Raphael and his followers and pupils finished the loggias of the Vatican in Rome (1513-1519), thus creating the most beautiful and artistically interesting porticos in the world. (Figs. 226, 227). Their style of decoration thereby attained to classical importance.

151 Besides this ornamentally conceived decoration, there continued in use in the high Renaissance the decoration of walls and ceilings by great paintings. Yet in accordance with the antique tendency of the time, the relief element in decoration became stronger, in order to produce a greater harmony of the subdivision of the wall with the architecture. The colored ornamentation on the walls thus gradually receded in favor of the purely architectural ornamentation. The late Renaissance finally limited it in great part to the ceilings, indeed there to the large paintings in the main and some side panels (Fig. 224), while the others were left in white stucco and partially gilded. The tendency toward relief dominates even painting, which frequently falls into the imitation of architecture, sculptures and statues.

On facades after the beginning of the 16th century, painted ornamentation already receded. Likewise there the essentials of the structural appearance consisted of the architectural framework with the sculptures. Finally Renaissance decoration appears in complete dependence on the architecture and sculpture, certainly designed to enhance their pompous effects.

In ornament the basis was formed by antique ornamental motives and decorative forms, the Roman acanthus with its foliage and scroll work in combination with vases, candelabras, masks, cornucopias, trophies, bands, wreaths and garlands of flowers, with interwoven representations of figures, together with frets and wave lines. The foliage was taken from the native plant world and treated naturally or conventionally, in the latter case in direct connection with the antique. The masters here proceeded very properly, when they shaped leaves and scrolls to be executed in marble, differently from those in wood, and those in terra cotta again differed from bronze foliage. Pu.

Purest in drawing and execution appear the ornamental forms chiseled in marble; for these are especially characteristic again the panels cut in the pilasters instead of flutes. (rejected from the first in the Renaissance). The latter rise from flower corollas or vase forms as organic combinations of conventionalized leaf forms, particularly of the antique (Roman) acanthus and its interlaced scrolls (volume 1, Fig. 138) with naturally treated forms of all kinds, leaves, flowers and fruits, that either form a single stem of candelabra-like flower stalks growing above each other with corollas and vases, or follow a series of spirals, the whole animated by birds and other animals, as well as fabulous beings, heads and feet of animals, which directly pass into the plant work. (Fig. 228). Other panels consist of trophies, weapons and coats of arms, that are grouped together with objects of the most different kinds, and are ornamented by conventionalized and natural foliage and scroll work. This ornament already received in the Quattrocento the not exactly appropriate appellation of "arabesques". (Volume 1, page 214). It appeared in the 15th and the beginning of the 16th century as a nearly independent result of the art of the time, and it essentially differs from the "grotesques" occurring in the first quarter of the Cinquecento. The arabesque is always a surface decoration generally arranged according to geometrical rhythm, filling, connected and growing by itself, which was originally executed in relief. (Fig. 228). But the grotesque rather represents a loose and fanciful arrangement of the motives from art, nature and life in a continual alternation of ornamental work with framed pictures, medallions and shields, executed as a combination of ornamental relief in stucco with painting. (Fig. 227). The grotesque also experienced an infinitely more varied use, when it was no longer restricted to the frames and the character of the ornaments filling them, but also extended over larger portions of the walls and even entire ceilings. (Fig. 223).

After the grotesque ornament had reached its climax in the Vatican loggias, it rapidly receded. The decorations created with refined and tactful feeling in perfect harmony by an art caprice adjusted most happily must lose their charm, as soon

as they were transferred in a merely imitative way by less gifted artists to areas, for which the originals were not intended. To this was added the great predominance of the architecture calculated for a general structural effect, which so far as the works of the severe theorists did not come into consideration, was corrupted almost capriciously in its profiles, and the love for individual things was no longer applied to the details, but was based on their former treatment. The relations between figure and pure ornament, so carefully adjusted in the best period, between stucco and color, area and frame of the picture, became variable and uncertain. The composition fell into a patterned and expressionless series of lines, into a heavy treatment of details overloaded in relief. Thus the decoration lost its importance and its esthetic intent in the same measure, in which the architecture passed into the grandiose and must strive for that scrupulous heightening of the effect, that should aid the imperious feeling of the owners, directed toward the pompous in the late Renaissance.

175 V. The Architectural Works.

A. Church Architecture.

The dominant circles in the Christian church at the appearance of the Renaissance were still too greatly embarrassed by the mediaeval conception of art, that they could not at first meet it with a full understanding. They remained alternating, varying and uncertain toward the new movement, even if they did not oppose most decidedly its "entire nature and tendency" and that of humanism as a dangerous intellectual tendency based on pagan views. But after the Renaissance had explained itself and had reached a certain maturity, the Roman papacy -- and this merits special consideration -- saw in the "adoption" of the genuine Renaissance in the ecclesiastical circle of ideas, an extension of the limited mediaeval idea into a generality. * Thereby ecclesiastical art was led out of the restraint of the Gothic world of form into a freer activity, appropriate to the time.

* Kraus. *Geschichte der christliche Kunst.*

The most important innovation experienced by church architec-

architecture in the period of the Renaissance consisted in this, that men no longer held themselves bound to the ritual basilican system, but saw in the central building, whose precursors in the round and polygonal structures of the Roman, Early Christian and Romanesque periods still in great part remained before their eyes, the most perfect model for the Christian House of God. * * This afforded greatness, unity and uniformity in the creation of the interior, the most favorable arrangement of the light, and a harmonious subdivision of the interior and of the exterior. In it the high middle room covered by a dome formed the nucleus of the building, erected on a round, polygonal or square ground area, and to which was added either four tunnel vaulted cross arms (according to the model of the Byzantine church; volume 1, page 188), outer aisles, or a circle of chapels. Yet the central design did not exercise supremacy -- and aside from the chief works of the high Renaissance -- it did not once predominate over the basilican system. For this had been connected with the sacred tradition for so many years, for the idea to be suppressed, that it had the true and pure form of the Christian church building. To this was added, that the central structure still represented a scheme too strongly restricted in itself, that the enlargement of the interior and the addition of chapels and subordinate rooms with a free development of the facade, on which men placed special value afterwards as before, did not abate as favorable. Thus in the early Renaissance beside the horizontally covered, or cross vaulted basilica was developed the central building, as being on the whole a new form of church building in the West, and it attained in the high Renaissance its highest, nearly absolute perfection. In the late Renaissance men came to combine the central building with the basilica in the manner, that the former was chosen for the design of the choir and this was adjoined by a nave. Individually the Renaissance churches have the most decided variations in the ground plan and elevation; always characteristic is the unified creation of the interior, the dome over the central area, or the transepts, and the architectural system peculiar to the Renaissance.

* * How strongly the central structures with domes affected

the masters may be seen, in that such already in the earliest time were represented with very particular favor on the backgrounds of their altar paintings and reliefs.

For buildings with naves the three aisled basilica, as it had been developed in Romanesque art with its proportions of masses in the width of the middle and side aisles, formed the basal scheme in the arrangement of the supports and the division of the bays of the vaults. The vaulting was either executed in all the aisles or only in the side aisles, while the middle aisle either received a horizontal wooden ceiling, or if even more rarely and scarcely except in the early Renaissance, the visible wooden roof framework. The Renaissance generally continued as being opposed to the hall type. The churches of the Orders strove for simplicity and were mostly single aisled with a row of chapels at both sides and a horizontal ceiling. From the middle of the 16th century onward such single aisled churches were also preferred for parish churches and were vaulted, either with a tunnel vault, intersected by the cross compartments over the windows, or by flat domes, arranged along the longitudinal axis. These single aisled churches extended by rows of chapels at the sides finally became the prevailing type of catholic church architecture. The towers (Fig. 229) in Italy in the time of the Renaissance also chiefly stand detached beside the building; only in the 16th century were they sometimes arranged in pairs and included in the composition of the church. Particular attention was devoted by the Renaissance to the sacristies, which were arranged on the northern side of the church in the angle between transept and choir, for the safekeeping of the church vessels and vestments, for the library, and as a waiting room for the clergy, before and after divine service. They are mostly additions, indeed being preferably treated as small central structures and are frequently very richly equipped. (Figs. 222, 230).

The structure for single aisled churches shows a subdivision of the walls by pilasters or engaged columns with arches turned between them over the chapels or the window openings. For designs with several aisles columns appeared at first and indeed principally in the early Renaissance as supports of the

walls of the middle aisle with ceilings with the antique subdivision by beams and arched forms, or octagonal piers were employed in their places. In the high and late Renaissance the internal free supports are mostly in the form of square piers (Fig. 231) with half columns or pilasters projecting from their sides, to which corresponds a similar subdivision on the walls. From the piers frequently rise cross arches, which span the aisles and divide the ceilings into bays. The walls in northern Italy often exhibit the natural rubbed sandstone, or they are satisfied with white plaster; but in the South they show a rich magnificence of color. The decorative equipment of the interior reaches its climax in the altars and particularly in the tombs, that exhibit the contemporary longing for fame; these in structure and in detail forms are treated in accordance with the architectural system of the Renaissance, and they are developed with very particular care in their painted and relief decorative work.

The external architecture at first retained the mediaeval system with a new clothing in the Renaissance forms. As in the middle ages, it was chiefly executed later by facings, * and was limited principally to the front facade, the choir and the dome. The sides remained in the early Renaissance entirely plain without any subdivision; first in the course of the 16th century did they receive a modest and similarly treated coating of plaster. The main facades at first follow the antique elevation of the Roman triumphal arch with an order standing on a high pedestal and with a crowning pediment. (Fig. 232). Later (first on the cathedral of Pienza in 1462) the church facade was chiefly arranged in two stories, perhaps caused by the requirements of obtaining an elevated loggia for bestowal of the blessing. The architectural development of the facade for basilican designs presented many difficulties, in that a satisfactory ending in the front facade must be given to the low shed roofs of the side aisles. The problem was most simply solved by attaching a half pediment (with inclined ascending cornice) to the front wall of the middle aisle. For curved roofs the quadrant was indeed also employed. Alberti chose the volute as the termination of the shed roof on S. Maria No-

Novella in Florence (completed 1470), thus creating a motive, that the later Renaissance frequently employed, often superfluously. With such a form of facade the cross section is expressed in a facade but slightly or even not at all, and therefore it is only satisfactory in a slight degree. Happier are the solutions, in which the facades directly terminate in the form of the roof, indeed in a half or quarter circle, as on some churches in Venice and on the islands of the Adriatic Sea. (Fig. 233). In the treatment of the portals, windows, cornices and the like, the developed Renaissance adheres always to the classical ground principles, but at the same time with the same richness as in secular architecture.

** By far the greatest number of the Italian Renaissance churches have never been completed externally, but have remained in the rough construction.*

Monastery designs were allied to church architecture and retained the mediaeval grouping of the buildings, but by the beauty and variety of the porticos around the courts with columns and piers, they again attain to a peculiar artistic importance. The monasteries of higher rank are usually extended architectural designs, which compete in the equipment of certain rooms with the churches and the palaces of the great.

B. Secular Architecture.

The great Italian palace structures in the early and high Renaissance still permit the endeavor of the ruler to be recognized, in consideration of frequently very stubborn opposition, to overpower rivals, leagues, cities and influential families, and to care for his personal safety, when he gave his residence the form of a palace indeed, but otherwise protected it. They surrounded their castles by moats and walls, built defensive towers at the angles, as well as also selecting a site protected by nature. First in the late Renaissance such arrangements were omitted. The ground plan varied in most of the building problems, but from the beginning onward it always forms a building area in regular geometrical (rectangular or even polygonal) form enclosing one or more internal courts, which always evidence a constant endeavor for suitability and convenience.

The palaces of the nobles already had a regular plan in the Gothic period (page 163), which was also retained by the Renaissance, and was further developed in its tendency to comfortable living and to show. In the different architectural regions were developed individual peculiarities. The earliest type is the Florentine -Sienese, which has a determining importance for all Italy, particularly by the advantages of its form of ground plan. The ground plan groups and indeed the halls for each purpose, among which are dining halls for each season of the year, house chapels etc., as in the antique house, around an uncovered court surrounded by porticos, from which are entered the rooms arranged in the ground story. In the upper stories are found closed corridors over the porticos, from which doorways lead into the halls. To the designs of stairways and the treatment of the facades have we already referred on pages 184 and 179. Likewise in Urbino, Ferrara and the Romagna the palaces follow the Tuscan model, also in Bologna, but there with the peculiarity, that the facades in the ground story next the streets are interrupted by continuous arched porticos.

The Roman palaces take from the Tuscan type the ground plan, but in the treatment of the facade are inclined to an expressed architectural treatment, as indeed best characterized by palace Farnese. (Figs. 251, 211, 258). The chief stress is placed on a grand effect of the court, on which the open columnar or pier porticos frequently extend through several stories. The late Renaissance introduced in the facades in Rome as also elsewhere, particularly in Vicenza, Genoa, Milan etc., the "colossal order", i.e. a row of great columns or pilasters, which extend through all the stories from the plinth to the main cornice. (Figs. 235, 273). Thus especially in the imposing facades of Michelangelo and Palladio the pseudoperipteral colonnade of the late antique again appears also in the late Renaissance.

In the Venetian palaces is expressed a strong reaction of a mediaeval art. The design of the building firmly adhered to the scheme developed by the Gothic. (Page 184). The chief attention of the master in the city of the lagoons was paid to

the ornamental, that in the time of the early Renaissance still chiefly assumed Gothic forms, but later a splendid columnar architecture with a cheerful intent.

Villa architecture took an important place with the general enjoyment of nature and the expressed inclination to staying in the country from the beginning in the Renaissance period. Men already early distinguished between the proper country house intended for a longer residence and the "suburban villa", a pleasure house located before the city for slight or transient occupancy. The ground plan had generally a symmetrical design, in which the rooms were grouped around a rectangular or circular central hall. Since these buildings in the country were not intended for a development in height, they were mostly one story. The servants had their rooms in the cellar story or in the upper "concealed" half story (mezzanine) in the late Renaissance, which in the time of the theorists also came into use in the palaces more and more as intermediate stories. The suburban villa was preferably placed on a gentle slope; it was invitingly and cheerfully treated.

In the high and late Renaissance great importance was attained by the garden and park designs connected with the villas. In direct connection with the villa was a show garden (Fig. 287) adorned by terraces, balustrades, flights of steps, fountains, cascades and sculptures of all kinds, accessible by magnificent gateways and with picturesque perspective views of distant hills, cities and villages. In these Italian gardens predominated architectural lines, in contrast to the "English" gardens preferring free nature (see volume 3), and the former strove for a harmony with the buildings; they were conventionalized designs subordinated to the architecture.

The dwellings in the cities, like the palaces, adhered to the antique ground plan as much as possible by grouping the rooms about a court, surrounded if possible by porticos on one or more sides. The dwelling generally was in the upper story; the ground story being chiefly utilized for shops, stables, coach houses and the like. For officials, artists and learned men houses for rental were erected already in simple and sometimes in rich treatment.

Contrary to Alberti's reference to the advantages of curved streets, * the city lay-out preferred a straight course for the streets. The more important cities competed with each other in the straightening of the streets and the preservation of continuous lines of houses. Everywhere men looked after obtaining larger open squares, surrounded by sale booths and airy porticos. These and the streets in the more eminent portions of the city were paved, and the churches and public buildings were surrounded by raised walks.

** He said that the city appears larger, the houses present themselves to the eye with variety, shade was then wanting in no street, the wind was stopped, and defense against enemies was made more easy.*

Among public buildings the city halls stood in the foreground, (in Italy chiefly named palazzo comunale, municipio, del consiglio, della regione etc.). In the early Renaissance they still have the castellated appearance with defensive galleries and battlements, but later are buildings like palaces with a regular arrangement of windows, widely opening entrance halls (Fig. 239), great stairways, large halls for assemblies and sessions, with wide corridors for access to the halls, and the smaller working rooms and the house chapel, seldom wanting in the city halls.

The universities (page 156), high schools, and which chiefly jurisprudence and medicine enjoyed a high regard in the Renaissance period. They retained in the early and the earliest high periods the traditional cloister plan, which also corresponded to the antique arrangement, and a suitable grouping of lecture halls and rooms around a quiet court enclosed on all sides was made possible. Later these buildings for instruction were elevated to magnificent structures in a grand style with impressive courts with porticos and grand stairways.

In close relations with these stood the libraries, elongated and in one or more stories, well lighted, mostly richly decorated rooms with cases or chests along the walls for the preservation of the books and with tables for writing and reading. They were not alone erected as state buildings; nearly every city had its own library.

It confers particular honor on the Renaissance, that the hu-

humane tendency of the age is also recognized in the ~~care~~ for the physical welfare of the sick and the poor by the erection of hospitals. These are frequently great and monumentally treated architectural designs with open entrance porticos, spacious, light corridors, large wards for the sick, and the subordinate rooms for physicians and servants, arranged around airy internal courts with thorough regard to the special requirements of these buildings and their sanitary arrangements..

For commercial traffic served the market halls, i.e., spacious covered porticos, open on two, three or on all sides. For public assemblies of the council, of certain corporations, and even of certain families on particularly important occasions loggias were erected as vaulted arcade porticos, such as partly already occurred in the middle ages. (Page 163).

The public fountains in the period of the Renaissance attained to an importance as ornaments of the public squares, similar to that formerly in the Roman state. They are in part detached buildings with prominent figure representations, in part architectural show pieces in the form of the antique triumphal arch with rich sculptures. Likewise monuments, especially bronze statues with carefully proportioned architectural substructures, were erected in great numbers as a visible expression of the strongly developed feeling for personality and the reverence for fame in the time. Even the ancient Egyptian obelisks came into honor again, when they were chiefly procured by the Roman popes and erected on great squares.

On the contrary the theatres by far did not occupy that position, which they had in antiquity. They were mostly built of wood after the ground plan of the Grecian theatre with a stage of small depth, that in part already presented a view of the city constructed in perspective with a painted background. (Figs. 272 a, b).

With the public buildings are further counted the fortifications, which experienced a thorough transformation in the Renaissance. With the introduction of heavy cannon, the high gate towers lost their former importance. In their places appeared low and broad gateway structures, which by a rusticated facing with pilaster and columnar architecture acquired a fri-

friendly, rather than a defiant expression. (Fig. 260). The mediaeval battlements possessed no further value. Bold cornices, often resting on consoles, rusticated ashlar at the angles and also in part on the wall surfaces form on these and on the bastions the most common artistic means of expression for the architecture of fortifications. Finally we have yet to mention the bridges, which likewise by the adoption of the Renaissance treatment with a tendency toward the forms of ancient bridge structures, were drawn within the circle of the beautiful.

VI. The Most Important Monuments.

1. Early Renaissance.

TUSCANY AND MIDDLE ITALY. -- The grand series of architectural monuments of the Italian Renaissance was commenced in Florence by the works of its first chief master and founder, the genius Filippo Brunelleschi (1372-1446). His earliest and epoch-making great work consisted in the previously mentioned erection of the dome of the cathedral of Florence. Almost contemporary with this (1421) he began the new building of S. Lorenzo as a three aisled cross basilica with rows of chapels along the sides, side aisles vaulted by domes, horizontal ceiling in the middle aisle (Fig. 240) and a low dome without drum. In his second larger church building, S. Spirito (begun 1436), likewise a cross-shaped columnar basilica, the master already exhibits a substantial advance from his system developed in S. Lorenzo. The ground plan comprises a Latin cross consisting of two rectangles of equal width. The side aisles are there extended by semicircular chapels and are carried around the nave, transepts and choir. (Figs. 241, 242). Both churches were first completed after his death. Unfortunately they remain without facades. The new ideal of the central building was carried out by him first in the old sacristy of S. Lorenzo, with which he began the erection of the church, then in a more mature form in the Pazzi chapel (1430-1443), indeed on the ground plan of a not fully developed Greek cross with low dome on a low drum, a work that in beauty of the interior, clarity of structure and treatment of the details, belongs to the noblest, that the Renaissance has produced. Brunelleschi was also the

founder of the Florentine palace style. He introduced rusticated ashlar construction, and created in palace Pitti (about 1440) an extremely impressive model for its use, though only a part of the building can be attributed to him. Furthermore also in the earliest of his secular buildings remaining to us, the upper story of palace di Parte Guelfa (after 1418), although even if the facades are still timorous, they are subdivided by pilasters, and in the portico of the Foundling Hospital (designed in 1419) he established a columnar structure with round arched arcade in strictly classical beauty. (Fig. 248).

Among his successors first to be mentioned the Florentine Michelozzo di Bartolommeo (1396-1472); he was originally a bronze-founder, then a sculptor in stone, and finally (after 1455) court architect of the Medici in Florence. To him is due the origin of the beautiful passage to the sacristy and the chapel of the Medici in S. Croce in Florence, that still stands on the transition stage, and the new building of the monastery of S. Marco (1437-1443) with a splendid cloister and grand three aisled library hall. The master attained greater importance in palace architecture. Palace Riccardi in Florence, formerly erected for the Medici and probably in the thirties (1430-1440), is his work. (Fig. 209). His beautiful columnar court with Composite capitals is the model for countless palace courts of the 15th century.

Michelozzo's pupil and successor was Giuliano da Majano (1432-1490). Like Michelozzo he was cathedral architect in Florence, busied himself in church architecture chiefly by restorations and extensions, erected in Siena palace Spannochi, a refined repetition of palace Riccardi of Florence, and was also engaged in Naples, as we shall see later. (Page 213).

An independent position is occupied by the learned and many-sided Leon Battista Alberti (1404-1472), one already belonging to the most fertile leaders of the Renaissance by his writings on architecture, sculpture and painting. Doubtless he stood nearer to the antique than to his contemporaries. Yet he invariably demanded an independent, i.e. a creative position for the prototypes. In the year 1446 he commenced his first church structure in the rebuilding of S. Francesco in Rimini, of

Which the but partially executed facade in the lower story is imitated from the arch of Augustus in Rimini. In the same year he began palace Rucellai in Florence, whose erection he entrusted to Bernardo Rossellino. (According to recent investigations, this palace must certainly belong to Rossellino). In this structure Alberti undertook an advance, fruitful for the further evolution of the Renaissance, when he allowed the rusticated ashlar to recede and subdivided the facade by pilasters set above each other in the Roman arrangement. (Fig. 217). The church of S. Sebastiano in Mantua was commenced in 1459, now existing only in ruins, he for the first time based on a pure Greek cross. In S. Andrea there he established a model for single aisled churches with wide side chapels and a coffered tunnel vault (Fig. 244), and a portico with pediment occupying the entire height of the interior, on which we find again the classical system of the temple facade. (Fig. 232). For S. Maria Novella in Florence he designed for the Gothic building the incrustated facade with the volutes already mentioned on page 196. Whether the design for the palace della Cancelleria in Rome, recently attributed to him, was by him is not yet assured.

Alberti's pupil, Bernardo Rossellino (1409-1464), was chiefly employed in Florence as a sculptor in stone. From 1460-1463 and in the service of Pope Pius II as architect of the city of Pienza, named after him, he erected the facade of the cathedral (page 138) and palace Piccolomini, whose facade is entirely arranged on the system of palace Rucellai in Florence.

Among the remaining masters of the Florentine early Renaissance, Giuliano da Sangallo (1445-1516) occupies a prominent place. He was cathedral architect in Florence and finally even the leading cathedral architect of the church of S. Peter in Rome. His little church of Madonna delle Carceri in Prato, he erected in 1485-1491 as a central structure with a central dome and four tunnel vaulted cross arms. (Fig. 245). In its proportions it is a simple and noble creation with the happiest effect, that has frequently found imitations in modern country chapels. Likewise the beautiful octagonal sacristy of S. Spirito in Florence (1488-1492) was treated on the central sys-

system by Giuliano da Sangallo. Of his palace buildings, palace Gondi (1490-1498) is that best known on account of its magnificent columnar court with the picturesquely inserted stairway. (Fig. 221). For the grand palace Strozzi (Fig. 246), which was begun in 1489, the master furnished a model. His part in the execution itself is not yet determined. As its chief master is rather mentioned Benedetto da Majano (1442-1498), who also created the charming portico of S. maria delle Grazie near Arezzo. (Fig. 247). Palace Strozzi is the most impressive rusticated structure in Italy. The very effective main cornice was constructed in the year 1500 by Simone il Cronaca (1457-1503) as an enlarged imitation of a Roman cornice. By Cronaca is likewise the court of palace Strozzi, and further the noble palace Guadagni, in which the upper story forms an open loggia extending along the entire facade beneath the widely projecting roof, also San Francesco al Monte before the gate S. Miniato, a church of a mendicant Order with visible framework of the roof, whose simple beauty also surprised Michelangelo. Antonio da Sangallo (the elder; 1455-1534), a brother of the Giuliano mentioned above, in his chief work, the central structure of the Madonna di S. Biagio near Montepulciano (1513-1537), already stands on the stage of the developed style of the high Renaissance. (Fig. 248). -- The three masters just mentioned are the last representatives of the Florentine early Renaissance; in them was completed the transition to the high Renaissance.

The influence of Florentine art was expressed with particular strength in the neighboring Siena, where the early Renaissance took quite the same development. There arose a powerful leader in Luciano da Laurana (died 1479), the creator of palace Prefettizio in Pesaro (begun before 1465), on which for the first time the window enclosures are treated as pilasters with entablatures, and the famous ducal palace at Urbino (after 1466) with a columnar court of extremely noble design. Laurana rejected rustication in favor of a stately architectural subdivision. More purely than all his contemporaries did he comprehend the classical expression of art and bring it out in his works.

UPPER ITALY. Here the traditions of Gothic had an infinitely greater effect than in Tuscany and middle Italy. Still at about the end of the 15 th century (1487) were architects called from the North to Milan for advice to the masters carrying on the erection of the cathedral. And yet the refreshing breeze of the new spirit makes itself perceptible on Lombard soil in the entire art life. It is particularly noteworthy, that here, where Romanesque art was so deeply rooted in the popular feeling, many masters found the way to the Renaissance in the return to early mediaeval art forms. Romanesque columnar galleries again appeared (Fig. 249) with the characteristic corner leaves on the bases of the columns, yet with capitals, that already belong to the new treatment of the forms. Thus in upper Italy was completed the transition from the middle ages to the Renaissance in a peculiar style, prevailing until the end of the 15 th century, with combined classical and Gothic motives having a rich picturesque effect and a strong charm in the treatment of details. In the entire first half of the 15 th century it still bears a predominant Gothic character; then the harmonious keynote of the Renaissance ever more strongly appears, until at the end of the century it acquires entire clarity and purity.

The first important works of the Renaissance in Milan are referred to a Florentine, Antonio Averlino, named Filarete (1410-1469), who was called by duke Francesco Sforza to erect a castle there (1451). The parts of the structure erected by him no longer exist. Yet his chief work, the Great Hospital (Ospedale Maggiore), of which indeed only a portion was executed by him, affords evidence of his activity. Filarete, the inspired adherent of classicism and expressed enemy of Gothic,* entered into a compromise with it as a concession to Lombard taste, when he employed the pointed arch on the windows, certainly covered by the most charming Renaissance ornaments. (Fig. 215)

* Filarete about 1480 said of the Gothic: -- "accursed be he that invented this blunder; I believe that only a barbarous people could have brought it to Italy".

About the same time the church of Certosa near Pavia (page 132) received its external architecture in Renaissance forms,

yet with many reminiscences of Romanesque art. The magnificent cloister with small marble columns on attic bases with corner leaves and with arches and cornices of terra cotta (Fig. 249) belong to the best works of Lombard early Renaissance. A show piece of the rarest kind is the famous marble facade of the church, on which were engaged a great number of the most important sculptors, under the lead of Giovanni Antonio Amadeo (or Amadeo) from 1474 onward. In its transcendent wealth of separate statues, relief panels and minor sculptures of all kinds, it appears like a colossal marble wall covered by representations. (Fig. 250).

On the cathedral at Como, the facade was executed in 1460-1478 in the Lombard mixed style between Gothic and Renaissance; then the sides of the old Gothic structure received facings in pure early Renaissance forms by the brothers Tomaso and Jacopo Rodari. The choir, transept and dome structure (begun 1573) already stand on the last stage of the transition to the high Renaissance.

About the end of the 15th century, there appeared in upper Italy a powerful revolution, which was introduced by the beginning of the activity of a great master of the first rank, Donato d'Angelo, called Bramante (1444-1514), a pupil of the already mentioned Laurana in Urbino, and born in a village near Urbino. Bramante was one of those powerful and many-sided Renaissance masters, whose ideas tended to grandeur, and who was gifted with a comprehensive view of the whole and an unusually excellent feeling for the effect of the interior, for the harmony of the structural masses, their subdivision, and for noble and beautiful proportions. Only the first time of his independent creation, of his development belongs to Molan (until 1499). In the year 1470 his activity in Milan commenced. His first work is the present transepts of the church S. Maria presso S. Satiro, built on a very limited area, that he covered by a central dome and two low tunnel vaults, for his characteristic conception of the choir facade, as well as the charming sacristy (Fig. 222), treated as a pure central building. In 1492-1499 he erected the choir, transepts and dome of S. Maria delle Grazie in Milan and the arched portico of S. Ambrogio. Also outside Milan several church buildings are referred to

Bramante in plan and also partly in execution. In their design he always gave the preference to the central building over the basilican type. We meet him again later in Rome, as the actual founder of the High Renaissance there. Yet already during his Milanese period, his influence was so great, that he gave his own stamp to the entire art of upper Italy. (Bramantesco stileⁿ).

Next to Milan the influential and splendid city of the learned, Bologna, formed in the Quattrocento an important part of the art climax of upper Italy. Still in the 15th century it was under the strong reaction of the Gothic. Even at the end of the century (about 1480) was erected a new structure (S. A Annunziata) entirely in the Gothic style. The early Renaissance expressed itself chiefly in additions and the rebuilding of older churches. So much more important is the palace architecture. We have already referred to the open arched passages along both sides of the streets (page 198); they impart to the view of the city an unusually friendly appearance. As in 2// Milan, here also the cut stone architecture is transformed into brick, whose form treatment assumes an elegant gracefulness. The earliest type of the numerous Renaissance palaces of Bologna is represented by palace Isolani (after 1453), on which the pointed windows of the principal story are flanked by fluted pilasters. An expressed Renaissance treatment is shown by palace Fava (1483) and palace Bevilacqua (begun 1481), on which the arched porticos are exceptionally wanting, and whose facade is entirely executed in cut stone, indeed in rustication with careful faceting of the different stones as diamond paneled ashlar. The windows are enclosed by richly decorated pilasters. The courts of the two palaces last mentioned are counted with the most beautiful columnar courts of the early Renaissance. According to the series of forms palace Fantuzzi (1517-1522) belongs here. (Fig. 251).

In Venice the Gothic held its place longest. The architects were also mostly sculptors, and in that world city so enriched by its commerce, they rejected unwillingly the picturesque openings in the walls and the splendid detail treatment of the Gothic expression of form. First in the last quarter of the

15 th story the Lombardi, an artistic family originating at 8 Garona on lake Lugano, introduced the Renaissance forms into Venice, certainly at first with a predominating decorative conception. Pietro Lombardo (died 1515) built after 1481 the beautiful palace Vendramini-Galeghi * (Fig. 252), and with his two sons Antonio (died 1516) and Tullio (died 1532), from 1480-1489 the splendid little church S. Maria de' Miracoli, whose facade is subdivided by orders of pilasters into two stories and terminates with a great semicircular arch.

** The building is dated with the year 1481 and the name of Pietro Lombardo. It was first completed about 1509. But on the city plan of the year 1509 it is still wanting. The plan and the commencement of the structure have in recent times been attributed to Moro Goducchi.*

In the remaining cities of upper Italy are crossed Lombard, Venetian and also in part Tuscan influences. Verona obtained by the important Fra Giocondo * (1433-1519) its elegant palace del consiglio (after 1476), that just like the loggia del Consiglio in Padua (after 1493) has in its lower story an open portico with an extremely noble treatment. In Brescia was commenced in 1492 the impressive palace Comunale, whose ground story contains an open portico, after the Lombard style and occupying more than half the width of the facade. The church S. Maria de' Miracoli there (after 1480) is a central building designed after Venetian models (Greek cross with four rooms in the angles), that on the exterior employs orders of pilasters with magnificent sunken arabesques and round arches as the upper terminations of the walls and candelabra columns in the interior, that rise from acanthus leaves and are charmingly decorated by natural foliage. (Fig. 253).

** Besides Bramante, Fra Giocondo was perhaps the greatest architect of his time in Italy. He first published again in 1511 the five books of Vitruvius.*

ROME AND LOWER ITALY in the 15 th century stand under the influence of Tuscan art and that of upper Italy. Most of the popes were favorably disposed toward humanism and called foreign artists to their court. Among these we find the learned Alberti, even if rather as an impelling force than as an exec-

executing architect, his pupil and colleagues Bernardo Rossellino and Giuliano da Sangallo. About the middle of the 15th century arose in Rome the first architectural works of the new style. The splendid period of the Roman early Renaissance falls in the reign of the Art-inspired Pope Sixtus V. (1471-1484). His chief master was Giacomo da Pietrasanta (died 1495). To him is due or a great part of the Vatican (Papal palace) and the church of S. Agostino (1479-1483) in Rome; besides he led in the erection and the restoration of the numerous older structures in the capital. Probably also is to be referred to him palace di Venezia (after 1451), which has a facade with very little expression, but it presents something noteworthy in its beautiful court (Fig. 254), where for the porticos square piers with engaged half columns are employed instead of columns, after the model of the Colosseum.

Under Innocent VIII (1484-1492) was completed the transition to the Roman high Renaissance. From this time (after 1486), if not earlier, dates a principal creation of the Italian Renaissance, palace Cancellaria in Rome. This noble structure was formerly attributed to Bramante, but he first came to Rome in 1499, after the Cancellaria had been substantially completed for at least three years. Recent investigations are inclined to ascribe the design to the great Alberti. The building actually appears as the highest development of the Florentine style proceeding from palace Rucellai, already entering into the high Renaissance. The facade shows in the ground story rustication with round arched windows, in the two upper stories being Corinthian pilasters with the appropriate cornices and windows with horizontal caps, in dignified and reserved projections and members exhibiting a refined feeling for style. The construction with its open porticos in two stories is the last grand columnar court in Rome.

Into Naples the Renaissance found entrance about the middle of the 15th century, indeed chiefly by the activity of masters from Florence and upper Italy. Giuliano da Majano (page 205) erected (after 1485) the noble gate Capuana, an arch with pilasters, high frieze and attic between two stately towers; he was also engaged on Castello Nuovo. (Page 132). Pietro di

Martino from Milan executed between 1455 and 1457 the festal hall of this castle, in which the details already appear in the purity of ancient Roman forms, and built the two story triumphal arch of king Alfonso I, greatly esteemed for its decorations in relief, near Castel Nuovo, completing the great show gate between 1461 and 1470. To the finest works of the Italian Renaissance belong the decorations of the crypt of the cathedral, executed by the Comacines, i.e. sculptors from Como in upper Italy, which has the form of a three aisled subterranean church and is adorned by ornaments of extreme richness. Of the buildings of Giuliano da Sangallo have been preserved in Naples only unimportant remains. The palaces, cloisters, additions and rebuildings of the second half of the 15th century are chiefly under Florentine influences.

SICILY, aside from few exceptions referred to foreign masters, still remained in the entire 15th century faithful to the Gothic style, and like lower Italy, even in the 16th century, it no longer appeared with important buildings.

2. High Renaissance.

With the beginning of the Cinquecento commenced the best period of the Renaissance. (Page 173). Previously had the attention been devoted to the substantiality of the architectural appearance and to the orderly arranged organism of its members. Not by unnecessary and merely accidental ornamental work should its effect be influenced. The decorative accessories, so much favored in the Quattrocento, were therefore restricted in their limits. The chief weight was placed on a correct subdivision of the architectural masses, on the harmonious proportions of the stories and the beautiful combined effects of the architectural forms. The columnar orders were more strictly treated in the antique sense, all members on columns and pilasters, on the cornices, windows and the like, were made in bolder relief, carefully profiled and more carefully drawn. The columns were restricted in their applicability and more and more lost their function as free supports in contrast with the piers, richly subdivided by engaged columns and pilasters, which could be graduated at pleasure according to their functions. The wide structures of porticos and churches with their

25 domes and vaults, the general spaciousness appearing in even the dwellings of the citizens, now came to its highest development in regard to beauty of internal creations and symmetrical proportions of architectural members. With an incomparable power of treatment of form, the great masters dominated space and materials, construction and forms, just as they generally practised all formative arts in a masterful manner.

ROME AND MIDDLE ITALY. -- The high Renaissance finds the principal scene of its evolution in Rome. The eternal city seems in architecture and the formative arts to show the dawn of a new age with the splendor of the former Roman imperial period. The role of leader was assumed by the great Bramante of Urbino. (Page 209). In the year 1499 he commenced his epoch-making activity in a little domed structure in the cloister of S. Pietro in Montorio, erected in the ground form of the temple of Vesta at Tivoli, with a Doric lower story crowned by a balustrade, and a smaller story with a dome, the whole a noble work with a distinguished perspective effect. Then he took up the rebuilding and new constructions of the Vatican palace, which had previously consisted of stuccoed structures. The court (cortile) at S. Damaso by him, and with the famous loggias painted by Raphael, afford particular interest (the uppermost of the four stories was by Raphael).

20 About 1505 Bramante received from Pope Julius II the greatest commission, that an architect had ever obtained, the new building of the church of S. Peter at Rome instead of the ancient basilica of S. Peter. (Volume 1, page 159). The most famous architects of the high and late Renaissance took part in this. * Bramante's design shows an entirely symmetrical central plan with four cross arms terminating in semicircles after the Lombard style, a mighty principal dome, four small domed rooms lying in the angles of the cross arms, four towers at the angles, the four apses of the cross arms projecting from the rectangles being treated as entrance halls. Thereby Bramante designed an internal creation of perfected harmony and an incomparably grand effect, such as no building in antiquity could exhibit in equal measure. Thenceforth the Greek cross passed for the most perfect form of the Christian House of God.

With the construction of the four piers of the dome, the vaulting, the arches and pendentives, and the partial execution of the superstructure from the southern arm of the cross and one of the side arms, Bramante fixed the internal proportions of the church of S. Peter. Its elevated beauty shows Bramante as a master, in whom the laws of art received their highest fulfillment in the same sense, as the case previously in the best ages of the antique. The marble facing of the Casa Santa in the cathedral of Loreto (1510) and the but half executed design for the palace Apostolico there, as well as the majestic harbor castle of Civita Vecchia are still today eloquent witnesses of his latest style, matured under the influences of the monuments of Rome. By them Bramante exercised a quite overpowering influence upon all his contemporaries and the evolution of architecture. Of the numerous churches directly to be referred to his school, S. Maria della Consolazione in Todi is the most important. (1508-1524).

* *The architectural history of the church of S. Peter (Fig. 255) shows the following masters to be the leading architects: - Bernardo Rossellini began a new building already under Nicholas V. (1452-1454), which was carried further under Paul II, 1470-1472, but then stopped. In April, 1508, commenced the activity of Bramante. He designed a new plan in the ground form of the Greek cross with equal arms and with a dome, using for the construction a portion of the existing foundations, erecting the dome piers with their vaults as well as a portion of the southern cross arm. Under Bramante Peruzzi and Antonio da Sangallo the Younger were engaged from the beginning of work on the design (in the year 1505) onward. After Bramante's death (March 11, 1514), Fra Giocondo and Giuliano da Sangallo assumed the leadership for a short time. Then (from Aug. 1, 1514) it passed to Raphael, who acted as the principal master until his death (1520) and carried on the building further in the sense of Bramante. From 1520 to 1524 all building activity ceased. Paul III energetically took it up again and entrusted the lead to Antonio da Sangallo (the Younger). He rejected the pedestals of the internal piers, raised the floor about 10.5 ft. and thus formed the Vatican grottos. His model is a*

still preserved in S. Peter. Shortly before his death (Aug. 3, 1548), he vaulted the southern and eastern arms of the apses. Under Antonio Baldassare, Peruzzi worked as assistant; a year preceding his death he was also appointed besides Antonio as a leading master of equal rank (after Jan. 1536). From Jan. 1, 1547, the continuation of the building lay in the hands of the aged Michelangelo (then 72 years old). He held fast to the general design of Bramante, but simplified it and intended to arrange before it a portico with a free colonnade. His principal attention was devoted to the dome, in vaulting which he went beyond Bramante's design. At his death (Feb. 18, 1564) only the drum was constructed. His successor was Vignola, to whom are due the small subordinate domes at the rear, planned by Vignola. After him (1573) the leadership came to Giacomo della Porta (until 1604). He carried into reality the grand project of Michelangelo for the dome in the years 1588-1590.

The imposing general impression of the central design, complete in itself, was only left to the building for a brief time. The clergy contended, that in view of the traditions for many centuries in Western church architecture, and particularly because a portion of the ancient basilica of Constantine had not been built over, whose consecrated soil was thus devoted to a secular uses, the Greek cross should be extended to the Latin. Carlo Maderna, leader of the building after 1604, by the command of Pope Paul V, with Giovanni Fontana, was compelled to add the existing nave (begun 1607) with the vestibule. The dedication occurred in the year 1626. From 1629 onward Lorenzo Bernini labored on the structure. He led in the internal composition, decided to erect two bell towers at the sides of the facade, but fortunately had to drop this plan and to tear down the tower, commenced in 1638. (1647). But otherwise is due to him the credit for improving the general design by the erection of the elliptical double colonnades (1655-1669), by which Bernini partly removed Maderna's errors. (Volume 3).

Bramante's favorite pupil and successor in the building of the church of S. Peter was Raphael Santi (1483-1520), the famous painter. His earliest work is the little and finely proportioned church S. Eligio degli Orefici in Rome (begun 1509),

in which he depended entirely on his instructor. In the villa Farnesina (1509-1511), a loggia structure arranged in rectangular form with two projecting side wings, Raphael erected the classical model of a dignified summer house with the happiest grouping of the elongated rooms and simple, nobly restrained architecture. As a great master of the high Renaissance he proved himself in the design and partial erection of villa Madama (begun 1515). There he introduced two subsequently much employed innovations, a three aisled vestibule and an arcade, where the archivolt rests on two short pieces of the architrave resting on columns. (Fig. 271). This building acquired for Italian villas a typical importance like that of S. Peter for churches. Of the other buildings of Raphael are yet to be mentioned the magnificent chapel Chigi in the church of S. Maria del Popolo at Rome (1512) and in Florence palace Pandolphini (1516-1529), on which the window enclosures have pilasters in the lower, and half columns in the upper story; the alternation of segmental and pediment caps above them first occurs here. (This alternation is certainly proved already in drawings by Bramante).

Raphael's most important pupil was Giulio Romano (1492-1546), likewise a very important painter, employed first in Rome and later in Mantua. His chief work is palace del Te (after 1525), the famous pleasure house of Gonzaga before Mantua, an extended building of rectangular ground form arranged about a great court with a splendid loggia on the garden side, the interior decorated in the most splendid manner. At his church S. Benedetto located south of Mantua, he retained the basilican form of the ancient church and the pointed cross vaults in the middle aisle, continuing the vaulted side aisles as a choir aisle with a circle of chapels around the semicircular choir, before which he placed an octagonal domed space.

His contemporary, the classically designing Baldassare Peruzzi (1481-1537) was under the strong influence of Bramante, under whose lead he was employed on the church of S. Peter (p. 216). He was very active in architecture, partly in his native city of Siena, partly in Montepulciano, in Bologna (there also designs for the beginning of S. Petronio etc.) and in

Rome, where he created (after 1533) his chief work, palace Massimo alle Colonna with a beautiful portico and magnificent court. (Fig. 256). Also the cathedral of Carpi (after 1513), an imitation of S. Peter in Rome, is attributed to him. In the Uffizi of Florence are still preserved autographic drawings from designs by the master, evidencing the grand architectural ideas, whose realization unfortunately was not permitted to him.

One of the chief pupils of Bramante was further Antonio da Sangallo (the Younger; 1483-1546), an architect highly esteemed in his time, even if less an epoch-making one. He was the leading architect of the church of S. Peter (page 216), employed in the erection of several Roman churches and chapels, creator of some palaces (Zarchioni Baldassari, Sacchetti etc.). His chief work is the vast palace Farnese in Rome (begun before 1514), the effect of whose facade is reduced (Fig. 257) by the closely set window axes and small windows, but is again improved by the magnificent main cornice constructed by Michelangelo. Very beautiful is the triply arched vestibule (Fig. 258), spanned by a coffered tunnel vault, and the court, whose two lower stories are imitated from the theatre of Marcellus; the upper story is by Michelangelo (after 1517). In this court we have the most perfect example of a court with piers treated in purely antique forms.

Florence had in the time of the High Renaissance in comparison with Rome only the importance of a provincial city. Architectural activity was restricted within modest limits in comparison to those of the preceding period. But the masters preserved their traditions and created in several palaces impressive and finely designed works. At their head stands Baccio d'Agnolo (1462-1543) with palace Bartolini near S. Trinita, the villa-like palace Giustini and the pleasing villa Castellani on the Bellesguardo. His two sons, Giuliano and Domenico, built palaces Ceramelli and Buturlin, the former recalling palace Farnese, the latter palace Guadagni. Giovanni Antonio Dosio (1533-1580) follows in his extremely noble palace Larderel (1580) the main lines of palace Bartolini, but belongs with his other works to the late Renaissance.

UPPER ITALY in the high Renaissance became the scene of new

artistic advances, and indeed is it here the eastern portion, that is quite prominent in the cities of Padua, Verona and Venice.

In Padua was employed the Veronese Giovanni Maria Falconetto (1458-1534), by whom is the palace Giustinani (1524) etc., distinguished by cheerful grace with magnificent columnar architecture. The greatest building of the city is the church of S. Giustina (Fig. 231), planned in colossal dimensions, begun in 1521 after the plans and under the lead of the Venetian Alessandro Leopardi (died 1522). The ground form is a Latin cross, covered (under the influence of S. Marco in Venice, supreme in this region) by domes over the crossing and the three short cross arms, low domes over the nave and transverse tunnel vaults in the side aisles; the latter are enlarged by rows of chapels. On the like colossal scale is arranged the cathedral, built in 1551-1557 by Andrea da Valle and Agostino Righetto, planned like S. Giustina, but the nave was later interrupted by a short transverse aisle, the side aisle being treated as domed rooms side by side.

Verona affords very great interest through the works of Michele Sanmicheli (1484-1559). This great master was first engaged in Rome as pupil of Bramante, but later returned to upper Italy. There he continued in the last manner of Bramante, while he combined the great monumental tendency and the refined feeling for beauty with an enjoyment of gay ornamental work in upper Italy. His earliest palace structure in Verona must be the noble palace Bevilacqua, whose facade in the ground story (as almost always with him) is subdivided by rustication in connection with projecting pilasters, in the upper story by fluted columns. (Fig. 259). On palace Canossa the entire ground story is treated as an open portico. The impressive palace Pompeii has frequently become a model for later buildings with its bold rustication (without pilasters) in the lower story and the great arched windows between columns in the upper story. Of the church buildings of Sanmicheli, the charming chapel Pellegrini near S. Bernardino at Verona (begun before 1554), frequently harmonizing in the design with the Tempietto in S. Pietro in Montorio (page 215), the famous great

round church of Madonna di Campagna, also by him but only erected after his death. Sanmicheli attained particular fame as the architect of the fortifications of the republic of Venice, in whose service he had charge of the fortifications of the mighty state as far as Cyprus. How well he understood also to give to the defiant fortresses a truly artistic effect may be seen on the magnificent city gates at Verona, among which the gate Nuova (1533-1540), gate S. Zeno (1541) and the gate Stuppa or Palio (Fig. 260), built 1542-1557, possess high artistic interest. Just on these appears with what refined feeling of the master, he understood how to employ the peculiar beauty of the Grecian-Doric style, indeed by the contact with Grecian art.

261 The capital Venice further received from Sanmicheli the imposing fortifications with the castle on the Lido (1544), and the noble palace Grimani on the grand canal (about 1550), whose classical architecture of the columns and windows denotes the climax of the Venetian palace style. But the chief master of the Venetian high Renaissance is the Florentine Jacopo Tatti, called Sansovino (1486-1570), an artist highly gifted as sculptor and architect, brought up in Florence and Rome, likewise a pupil of Bramante, but when beside his contemporary Titian was opened to him an important artistic position (after 1527), showed himself not sufficiently strong to reduce to the correct measure the strong decorative tendencies reacting from the early Renaissance. His style of Ornamentation is visible in Fig. 261 from palace del Municipio in Brescia, on which he executed the beautiful frieze of cupids and the main cornice. (The window architecture was by Palladio). Among Sansovino's church buildings, S. Giorgio de' Greci (1550) is indeed the most important, a single aisled design, spanned by a tunnel vault, whose centre is occupied by a dome. As his earliest palace structure passes palace Corner della Grande (1532), on which the Roman school appears with its aim for monumental effect; it has rustication, in two upper stories being double columns with arches placed between them. Soon afterwards (1536) he began the library of S. Marco, that famous long state building on the Piazzetta, in which the antique columnar architecture unites in one gush with the spirit of the Italian high Renais-

Renaissance in the gay Venetian conception. At the same time Sansovino built beside the Library the Zecca (former mint), to which he gave a somewhat more severe and earnest form in accordance with its purpose, and on the other side as a concealment of the tower of S. Marco the graceful loggia (1540), a marble portico as a magnificent show piece, that certainly is more prominent by the sculpture than the architecture. Sansovino was also engaged in the erection of the beautiful church of S. Salvatore, completed in 1534, which was previously designed in 1506 by Giorgio Spavento under the plainly recognizable influence of S. Marco (volume 1, page 194); Tullio Lombardi was the principal master in charge in 1507.

The library of S. Marco strongly influenced the later masters. Vincenzo Scamozzi (1522-1616) repeated still at a time, when the architecture of the Renaissance had already passed the last stage of its development, its architectural motive in the structure of the Nuovo Procuratie (1584), whose effect he plainly lessened by the addition of a third story.

Of Sansovino's pupils, there appears as the most important Alessandro Vittoria (1525-1608), who erected the tasteful palace Balbi on the grand canal.

Another master of the highest rank was further produced by the Italian Renaissance in the phenomenal Michelangelo Buonarroti (1475-1534). Born in Caprese in the upper valley of the Tiber, and trained in Florence in painting and sculpture, Michelangelo commenced his epoch-making artistic activity in the city on the Arno. Until the year 1534 he was chiefly in Florence, but was repeatedly and indeed for a longer time engaged in Rome and chiefly in Bologna; then he removed to Rome and remained there until his death.

Michelangelo is the last great architect of the Italian high Renaissance, who still belongs to the entire best period, gathered its power in himself, and showed to art new paths, within which its entire future development was restricted. He accomplished the highest in all three arts. In his works belonging to sculpture and painting is manifest a supermanhood, in which every ordinary form is increased to the gigantic, if this was required by the effect desired by him. And likewise in his architectural creations he appears like a titanic intellect,

which escapes from all bounds of antique and Christian tradition and matures the most strongly expressed individuality, such as architecture never exhibited before him and never after him. his eye was always directed toward grandeur, to the harmony and contrasts of parts in light and shade, of advancing and receding, of central and flanking architectural masses. Detail is for him an accessory, he only calculated on a sharply marked effect. His works were also accordingly fateful for the further evolution of architecture.

Michelangelo's activity as architect begins in the year 1516 with a design of a facade for S. Lorenzo in Florence, but whose construction was later again dropped, when he took up the works for the famous tomb of the Medici (after 1520) at this church. That is a square structure erected on a square plan and covered by a dome, with doubled pilasters and niches for subdividing the internal wall surfaces and rich sculptures, which are most harmonious with the architecture and are fused with it into an entirely unified and unsurpassed general effect. (Fig. 263). In the unfinished vestibule of the Library L Laurenziana (1523-1528) with the interesting entrance stairs (executed in 1558 by Vasari after Michelangelo's plan (Fig. 264) is expressed a complete breach of all restraints respected by former masters.

In ROME by Michelangelo is the splendid main cornice of the palace Farnese (page 219), and from his later time (after 1561) the much discussed gate Pia, that in the general design and treatment of the details already bears all the traits of the later Barocco art. The noble architectural group of the Capitol likewise is referred to Michelangelo in the arrangement and also partly in the treatment (in 1548 was commenced the rebuilding of the palace of the Senators and the splendid double flight of steps), but it was only carried out much later and with frequent variations from his design.

The master's great work in the domain of architecture lies in his labors on the new building of S. Peter's church (page 218). He undertook to carry on the construction, when he had already entered the 72nd year of his life. His plan shows (while retaining the ideas of Bramante) the Greek cross with

four apses, a mighty principal dome, and four small subordinate domes over the corner rooms, with a front portico conceived at an enormous scale, that nevertheless, in case that it had been executed, would have subordinated itself harmoniously to the overpowering effect of the main dome. The previously constructed four piers of the nucleus of the structure were externally strengthened, the apses were moved farther outward, the complicated angle structures were removed and simplified into square corner rooms. The drum (Figs. 210, 265) is internally subdivided by pilasters and externally by doubled free columns, whose aspiring motive continues in the strongly projected and tense ribs of the dome, diminished upwards, and reappears in the connecting and crowning lantern. Thereby the dome entirely loses the expression of weight. (On the construction of the dome, see page 173). To Michelangelo himself is only due the drum, and of the architectural treatment, the external covering of the outer portions of the choir and of the main piers in the interior. The dome was constructed according to his plan and model by later masters. Its effect is unequalled and imposing. Bold and sublime, it soars in majestic security and repose above the eternal city as a representation of the highest power and dignity, and as the most perfect expression found by the spirit of the high Renaissance.

3. The Late Renaissance.

In the late Renaissance (page 173) there set in with the leading masters a reaction against the subjectivism of Michelangelo, creating with the caprice of genius, that at first manifested itself as a return to the endeavor for the most perfect imitation of the antique in regard to its proportions and details, already occurring with Bramante and strengthened by Raphael, Baldassare Peruzzi and Antonio da Sangallo. We see in this a phenomenon of the intellectual life of that time of the counterreformation, which contested individual life in state and church, worked to strengthen the ancient teachings of the church, and emphasized the unconditional submission to its dogmas as the supreme basal law.

The character of the late Italian Renaissance was substantially fixed by two leading masters, Vignola and Palladio. They

were also learned theorists as well as distinguished practitioners. The unrestrained architectural treatment preferred by Michelangelo, as expressed on the gate Bia and the Library Laurenziana, they regarded as extravagancies, that offended "the good rule". So much the more strongly did they adhere to the canon derived from the antique, "they swore by antiquity alone". Yet even with them the influence of Michelangelo remained undeniable in the seeking for grandeur, for powerful effect of the architectural masses and subdivision on a colossal scale. Entire systems of half and full columns were added to facades in place of the wall piers. To the relief of the facades accounted thereby corresponds a stronger emphasizing of the portals and windows. Yet more than previously the antique architectural forms came into use in the external as well as the internal architecture. But they frequently come to a more conventionally conceived mode of decoration, often applied like a pattern.

ROME AND MIDDLE ITALY. -- In Rome Giacomo Barozzi, called Vignola from his native city (1507-1573) was the leading master. He was trained in Bologna as a painter, then at the order of the Vitruvian Academy in Rome (founded 1542) undertook measurements of Roman works of the antique, went to France in 1537, and in 1550 again to Rome. There he belonged to that circle of artists, which surrounded Michelangelo; yet he cannot be termed his pupil. In the year 1560 appeared his famous manual (*Rules of the five architectural Orders*), which exercised great influence in later times and even to this day.

As a practical architect we find Vignola employed on the grandly arranged villa of Papa Giulio (Pope Julius) before the gate del popolo (1550-1555), whose portico with upper story encloses the front court in a semicircle, and like the entire architecture of the exterior and interior makes a very dignified impression. (Fig. 288). His most important secular building is the imposing Farnese castle Caprarola near Viterbo (1547-1559). It is surrounded by a wide moat, is pentagonal and fortified by bastions, but otherwise is a design completed with the architecture of a palace, which encloses a circular and extremely beautiful court with arcades, with a magnificent

main stairway and very conveniently arranged apartments. There Vignola has most happily combined the type of the fortified castle with that of palace architecture and evidently utilized suggestions obtained in France. In the year 1564 after the death of Michelangelo he became the leading architect of the church of S. Peter (page 217). Very influential in church architecture became the principal church of the Jesuits, Il Gesu (1568) in Rome. In it is clearly expressed the change in the architectural tendencies occurring in the age of the counter-reformation. Men returned again to the old ritual basal form of Latin cross, but combined with it the effective form of the central building. Vignola then created in the Jesuit church a solution of the ground plan and treatment of the interior of amazing simplicity and artistic perfection. He gave to the central design four short cross arms with the width of span of the dome, lengthened the front arm to become a middle aisle, considerably wider than before, allowed this to end at the choir side in a semicircular apse, and vaulted it with a tunnel vault corresponding to the dome. But instead of the side aisles he arranged chapels. (Fig. 267). Vignola also fixed the cross section and planned the details, still kept within the conceptions of the high Renaissance, but more simple and massive. But his pupil Giacomo della Porta went considerably farther, who completed the church after Vignola's death. In the magnificent treatment of the interior and the facade subsequently designed by him is expressed a strong tendency to the picturesque in the sense of the later Barocco art. The church Il Gesu became a classical model for the churches of the 17th and 18th centuries and even influenced the church of S. Peter. The history of that church is also connected with the name of Giacomo della Porta, when he was called to erect the dome after Michelangelo's model, and thereby proved himself to be an architect of high constructive capacity. With the theorists of Rome is to be counted further Pirro Ligorio (died 1583), the builder of the splendid garden house villa Pia (about 1560), in the Vatican gardens, and the villa d'Este (after 1549) in Tivoli, famous for its unequalled park design. On the Pincio the Florentine Annibale Lippi (died 1581) built the palace villa

Medici for cardinal medici, now the French Academy. The facade toward the city is simple, but the garden facade is surprisingly rich. (Fig. 268); it sows in the open arched portico a and the rich ornamentation of the wall surfaces by antique reliefs and stucco ornaments the character of the late Roman casinos in their perfection. The building makes that dignified and cheerful impresion, peculiar to the works of the school of Raphael. We see here the charming and graceful, not striving for grandeur.

In Florence Giorgio Vasari (1511-1574), a many-sided artist and deserving writer on art, stands at the head of the architects of the late Renaissance. With Vignola he designed after the ideas of the architectura-loving Pope Julius II the previously mentioned villa of Papa Giulio (page 226), and in Florence the building of the Uffizi (1560) likewise commenced by him, on which he solved in a masterly manner the difficult problems there given. Two parallel wings with imposing porticos in the ground story flank a narrow street like a court and are connected by a transverse building, which leaves an open round arched passage toward the Arno. A greater activity in palace architecture was developed by Bartolommeo Ammanati, also known as a sculptor (1511-1592). Like Vasari, he consciously became a follower of Michelangelo. On the court facade of the palace Pitti (1558-1560), certainly more stiff than beautiful, he employed rusticated ashlers and half columns in all three orders. (Fig. 269). As a more refined master he showed himself on the noble bridge of S. Trinita over the Arno, which clothes the most suitable arched span in a very happily designed architecture.

UPPER ITALY In the late Renaissance became in several places the scene of a very important artistic activity. In Bologna Sebastiano Serlio (1475-1552) published in the year 1540 his influential "Books of Architecture". Pellegrino Tibaldi (1521-1592) there continued the school of Vignola in a number of small and well arranged buildings. Likewise in Milan was this architect engaged (under the name of Pellegrini) as the creator of the charming church of S. Fedele (1539), long regarded as a classical model, and as the restorer of the cathedral facade in the late Renaissance style, that was executed after

1616 after his designs, though not completely, -- and one may say unfortunately. -- The buttresses and upper parts were clothed in Gothic details, which appear like meaningless accessories in comparison with the animated forms of the doorways and windows. (Fig. 270). Tibaldi was a powerful and refined master in the creation of interiors and in architectural treatment.

In the east part of upper Italy further arose in the 16th century a chief master of the Renaissance, the great Andrea P. Palladio of Vicenza (1508-1580). In him we become acquainted with the most inspired and strongly convinced venerator of the antique, which Italian architects of the 16th century and of the entire Renaissance period have to show in their series. No master before him had studied with such devotion and thoroughness the architectural works of the ancients and so deeply penetrated into their nature, and none had understood how to embody the spirit of the later time organically in their treatment of forms with such sovereign domination, like him. In contrast to Vignola, who like the Roman architects generally of the high and late Renaissance preferred pier construction, Palladio cultivated columnar architecture. In the year 1570 appeared at Venice his "Four Books of Architecture", by which he has exerted a deep influence upon the evolution of architecture, effective until our own times. Palladio was just as strong in the theory as he was free and independent in creation in practice. He never ended with an ornamental effect, but allowed himself only to be guided by the arrangement and the feeling of proportions. He was so full of artistic power, that he filled his works, even in small dimensions, with rich monumental and architectural meaning. In his facades prevails the columnar system, particularly in the "colossal order" extended through two stories. Particular favor with him was enjoyed by the triple window with round arch over the middle window and architraves above the side windows (Fig. 271), a mode of treatment designated after him as the "motive of Palladio". This is certainly not entirely appropriate, since it is also found with Sansovino, with Raphael (page 218), with Bramante, and already on the palace of Diocletian at Spalato. (Volume 1). He restrained the ornament so far, that the clarity of the actual

structural elements could not be lessened thereby.

Palladio secured the first great architectural commission in the so-called basilica in Vicenza (after 1549), an enclosing of the old city hall, dating from the second half of the 15th century, by an open two story portico (Fig. 271) extending entirely around it, a work of great and rich effect. This was followed by the beautiful palace Marcantonio Tiepolo (1556) treated with a colossal order of columns, then palace Chiericati (1566) with open portico in both stories, and palace Valmarana (1566), that exhibits a colossal order of Composite pilasters. To palace Barbarano (like those previously mentioned in Vicenza), he gave (1570) relatively rich details, indeed with reference to the effect in the vicinity (it stands in a narrow street), to palace Prefetizio (1571) a massively effective Composite order (Fig. 235), which however appears less happily employed on the comparatively small building, than on the other structures of the master. Of Palladio's numerous villa buildings, his villa Rotonda near Vicenza is the most famous (Fig. 236). It has a regular square plan with four hexastyle temple facades and wide flights of steps on each side. Entrances from these lead to a round central domed hall, around which are grouped the rooms and the upper and lower half stories. On the whole, this villa makes the impression, that it was designed less for comfortable than for festal occupancy, and as a central and view point of a beautiful landscape. The theatre Olimpico at Vicenza, commenced by Palladio but only completed after his death, appears as an interesting attempt in the restoration of the antique theatre. (Fig. 272 a). It contains in an extremely plain structure the audience room, orchestra, stage and architecturally treated stage wall in the arrangement of the Greco-Roman theatre of Asia Minor, but so far introduced an innovation in that through the gates and doors of the stage wall are presented views in streets and thereby perspective depths, which were foreign to the former architecture of theatres. (Fig. 272 b). Likewise Palladio attempted great works in the domain of church architecture. His principal church buildings are found in Venice. The first of these is the church of S. Giorgio maggiore (begun 1565), magnificently loc-

located on the island of the same name and opposite the Piazzetta, a three aisled basilica with dome, transepts ending in semicircles, and a long monks' choir arranged as an extension of the main choir, from which it is separated by an open colonnade. The second and more important work, the most perfect church structure of the master, is the church del Redentore in the Giudecca, begun 1577, similar in ground plan to that one just mentioned, but single aisled with side chapels and shorter monks' choir. The interior of this church produces an impression of high beauty and solemnity by the powerful treatment of the interior and the bold and severe subdivision by a colossal order of columns and their entablature. Equally grand and monumental did the master treat the facade as a temple front forming the facade of the middle aisle with a colossal order of half columns and low pediment, against which are attached the fronts of the side aisles covered by half pediments, certainly without any organic connection.

Palladio was great and peculiar with all security in the conception and use of the antique architectural system in the architectural ideas, the creation of interiors and proportions. Already among his contemporaries his influence became perceptible. The stately so-called Library of the old seminary at Vicenza (Fig. 273) was executed under the lead of Vincenzo Scamozzi (1552-1616), but if not designed by Palladio, was strongly influenced by him. Likewise in his most imposing building, palace Trissino-Barton in Vicenza, Scamozzi shows himself dependent on Palladio. More than by his buildings (also see page 222) has this master influenced the later world by his great work, "Archittura universale", particularly architecture in Germany.

Into direct competition with the splendid city of the lagoons on the Adriatic Sea the republic and harbor city of Genoa entered after the first quarter of the 16th century. By the extensive trade with the Levant, of which it obtained a great part, it soon rose to great prosperity and wealth, which found fluent expression in architecture. The centre of gravity of Genoese architecture lies in palace architecture. This took from the first a peculiar and independent development, that in

the late Renaissance in a certain sense represents a more mature stage than the contemporary palace architecture in Venice and the rest of Italy. The lack of space and the building sites rising in terraces from the sea to the tops of the hills required in the narrow streets an abandonment of the monumental treatment of the facades. Men saw the centre of gravity in the interiors, the fulfilment of the requirements for living and in reference to dignified assemblies. To the facades was given an ornamentation better suited to an effect near by. The portal led into an imposing vestibule, but little elevated above the street level, from which by wide and gently rising stairs one passed into the court. This was certainly limited to small dimensions, but it received at its rear a special decoration by a fountain erected on the middle axis. In this way were obtained picturesque views and effects of lighting with distinguished effects, scarcely equaled and never excelled elsewhere.

The evolution of Genoese architecture is connected with the works of its chief master, the talented Galeazzo Alessi (1512-1572). Coming from Perugia and employed for a considerable time in Rome, where he came in contact with Michelangelo and Vignola, he shared with the former the great tendency, to which details are but a means toward the purpose, but a feeling for proportions with the views of Vignola. One of his earliest works is the beautiful palace **Municipio** in Milan, formerly palace **Marini** (begun 1558), in which the court is treated with an unusual richness in ornamental and sculptured decorative work. (Fig. 274). The great series of his Genoese palaces was opened by Alessi in the year 1559. The most important among them stand on the famous Strade Nuova, on which is arranged palace after palace. There are the still somewhat severe palace **Cambiaso**, treated in the Roman style and entirely covered by rustication, but already furnished with broken pediments over windows and doorways, beside it being palace **Mercari**, so picturesque by its open loggias in the upper story, and then palace **Spinola**, externally painted but equipped in the interior with imposing vestibule, stairway, upper porticos and court design. Of the numerous villa buildings of Alessi from the vicinity of

Genoa is to be particularly emphasized villa Pallavicini, located so beautifully on a high garden terrace with open arched porticos on the middle axis and a splendid balustrade crown; likewise villa Paradiso with its elegant loggia in the upper story extending the entire depth of the building and the treatment of the details already intended for a Barocco effect. Likewise as church architect Alessi attained high fame. His church of S. maria da carignano (after 1552) at Genoa, a domed church arranged in the plan of a Greek cross after the church of S. Peter according to Michelangelo's plan, with four towers at the angles (but two of which were erected), belongs to the most important church buildings of the Renaissance. (Fig. 275).

Among the contemporaries of Alessi, Giovanni Battista Castello (died 1569) deserves mention, the creator of palace Imperiale (1560), richly painted with figures and ornamental work (partly in bronze colors), and palace Carrega (now Cataldi) subdivided by pilasters, and furnished with a very beautiful vestibule and double stairways.

Of the other masters of the Genoese late Renaissance, Rocco Durago (died about 1590?) erected palace Doria-Tursi in the grand style, certainly rather pompously than nobly treated, whose rich facade subdivided by rusticated and fluted pilasters continues at both sides in one story open arched porticos, and Baccio del Bartolommeo Bianco (died about 1566), who on the facade of his palace University, begun 1523, no longer restricts himself within the limits of the Renaissance, but created a portico and an arcaded court with coupled columns (Fig. 276), such as he could have scarcely thought more beautiful or suitable.

The architects of the second half of the 16th century here mentioned still remained within the circle of forms of the Renaissance; they also continued severe in a certain sense, though not in the same degree as the other masters of this period. But in their works in the way and manner of the arrangement of the rooms, the regard to place impressive representations in the foreground, and their aim at the picturesque, perspective and lighting effects, and by the design of the details, they already exhibit a new spirit, that of the beginning Barocco style.

2. RENAISSANCE ARCHITECTURE IN SPAIN AND PORTUGAL.

The time of the Renaissance brought to the great peninsula in the extreme southwest of Europe a period of unusual prosperity and the climax of its political importance and power. In the year 1479 originated by the union of the two principal states of Castile and Aragon a great Spanish kingdom, which soon commenced a thorough political reorganization to strengthen its internal power and for a development of that directed externally. The Spanish monarchs placed themselves in the service of the Catholic church, for whose extension and in the name of its protection, they employed the sword. In the year 1492 the last remnant of Moorish sovereignty was conquered by the taking of Granada; in 1504 after an important participation of the Spanish army in the contests for Italy, the kingdom of Naples came under the Spanish monarchy, and in 1516 there fell to it by inheritance the crown of the imperial house of the Hapsburgs. Thus Spain became the centre of the world empire of the Hapsburgs, which then comprised Germany, the Netherlands, Burgundy, Milan, Sicily and the colonies in America and Asia. The enterprising spirit of the Spaniards, in whose country the affairs of foreign nations were settled and the fates of distant lands determined, rose without restraint. Already in 1492 had they discovered a new world; in 1519 a great Spanish realm was founded beyond the ocean, the kingdom of Mexico. The maritime commerce took a new and grand development. Its most important starting and terminal points were the Spanish harbors and Spanish cities. From the new parts of the world flowed into these unknown wealth.

In this time of a magnificent national and material advance great problems fell to architecture. The cities of the South were wrung from Islam and required impressive cathedrals; the extension and deepening of the Christian faith was required by the church and demanded the founding of influential monasteries and their energetic support; the princes and the great of the country longed for new palaces, corresponding to their dignity and their wealth, and the cities in their public buildings scarcely remained below the increased requirements. Thus the conditions of the time existed from the end of the 15th century for a welcoming reception of the Renaissance forms pe-

penetrating from Italy, and the external conditions of life were particularly favorable to their development. But by their forced growth were they compelled to accept materials from the different soil, saturated with the precipitate of the preceding art periods, which changed their character and produced a specific Spanish coloring.

The gifts of the Spanish nation substantially lay in the picturesque and ornamental by its strong mixture with German and oriental blood. The Mudejar style and the Florid style (*estilo florido*) (pages 141, 142) were produced by it the richest fruits. Yet is also found the Italian art invention in the creation of a unified and completed architectural organism, at least in the conceptions relating to the not inconsiderable Romanesque part of the population. The principal representatives of these were the architects called or emigrating from Italy, who besides other foreign architects from the Netherlands, France and Germany, were a determining influence on certain principal works of Spanish architecture. Under the combined and parallel effects of such unlike conditions and impelling forces, Spanish architecture attained an unusually diversified development.

The earliest influences of the Renaissance appear in the northern half of Spain and indeed in the "Plateresco" native there, that had its beginning about the year 1480. (Page 142). The Plateresco in its beginning appears as a decorative style, chiefly developed on Gothic principles, permeated and ornamented by Moorish elements without definite rules in a luxuriant grouping beside and on each other, in which Renaissance ornaments are intermingled in the cavettos, on the friezes, as panels, ornaments and the like, loosely and gracefully like overlaid goldsmith's work. * The Renaissance forms are gradually increased by pilasters, candelabra columns and mouldings, but which are at first conceived as entirely decorative. The new forms gradually predominate in the structure and in the ornamental work. Their arabesques and scroll ornaments soon become nearly pure in drawing (on certain works, for example the portal at the hospital of Santa Cruz in Toledo already before 1514. (Fig. 277). Yet they even then appear as an overlaid decoration, scarcely growing out of the organism of the architectural

members, but in graceful, unrestrained and spirited use, with an inexhaustible abundance of ideas, thus enhancing the effect of the frequently dry and heavily treated architecture.

** In not a few cases the Moorish style gives the keynote. Then Gothic and Renaissance forms appear as decorative accessories. On the whole the German architects called into the country, who remained there and were naturalized, have a rich part in the development of the Plateresco. They had learned in the North to thoroughly know the native Gothic, were very skilful in the art of ornamentation, particularly as decorators, as such readily took up the new motives of the Mudijar and later those of the Italian Renaissance, thus producing an unlimited wealth of forms, that was poured in lavish abundance over their architectural works, executed for the splendor-loving Spaniards.*

The Plateresco is an extremely interesting flower of Spanish civilization, a reflection of the nation fused from different races of people, the true style of the Spanish early Renaissance. We can place its beginning at about 1500, if we perceive the first time of the penetration of Renaissance motives in the Spanish series of forms still predominating in the Mudijar style. Certainly this determination of the time in general only applies to the secular and monastic architecture. The churches retain in part until 1530 their purely Gothic character, and also even until toward the middle of the 16th century are mostly in a predominating Gothic. (Page 140).

Besides the showy architectural style of the Plateresco, when extravagant ornamentation also surpasses all, that contemporary art produced in other countries, the severe Renaissance found entrance at a relatively early date -- already in the twenties of the 15th century --, indeed as a direct imitation of the Italian high Renaissance. The Spaniards term this style the Greco-Roman style. But its monuments (Fig. 278) are seen to not have grown on Spanish soil. They appear cold, lifeless and repellent in the land of the Mudijar and Plateresco, even with every care in regard to correct treatment of the details. The national stamp is even wanting to them. Likewise in the Plateresco about the middle of the 16th century appears a moderation in the use of decorative expedients. The Ita-

Italian Renaissance forms are more freely adopted, the organism wins in clarity, yet without rejecting the Spanish requirement of show.

The period of the matured style, the Spanish high Renaissance begins with the reign of Philip II (1556-1598). After the theorist Francisco de Villalpanda (died 1561) * had designated the classical orders as a direct inspiration of God to the Jews at the beginning of the temple, a conception also propagated by the Academy of Art founded in Madrid by Philip II, the antique canon appeared as a kind of dogma. The artists studied the antique rules with great zeal. Thus arose works of that universal Palladian style, which frequently differed in facades and also often in the palace courts from the similar buildings in Vicenza and London, only by their location. The cheerful and unrestrained enjoyment of life passed in them into a stiff and tasteless classicism. But on the few structures designed for show, particularly on portals, cloisters and also in the interiors of the palaces, there remains a peculiar Spanish architecture with a preference for gay ornamental work, even in this time.

** Villalpanda was a fertile writer on art and at the same time an eminent practitioner. He had measured and drawn the most famous Roman buildings, translated the 3rd and 4th Books of Serlio on Architecture, and he added to this not only a thorough training, but also a rare refinement of taste, particularly in the direction later termed Atticism.*

2. Among the successors of Philip II classicism continued. The unusual advance in the sciences and arts and the tense national feeling of the Spaniards also brought the architects themselves to their senses and to a freer expression of their peculiar mode of thought. Thus in church architecture, which so far at least in the North had remained entirely dependent on the Gothic cathedral system, the national ground plan again came into general acceptance, as it had already developed in the middle and southern portions of the country in the 15th century. (Page 141). Palace architecture never developed its own type. In the early Renaissance rectangular plans with straight facades are especially common, undivided lower stories are only animated by small and tasteless windows, richly dev-

developed upper stories opening like loggias, showy main cornices and ornamental roof crestings recalling metal works. At angles rise directly and without projecting from the facade, low tower-like structures with loggias and entablatures. These angle buildings and a certain preference for long and unbroken lines of the facade also form a Spanish peculiarity on the buildings of the high Renaissance. But otherwise the latter in the plan and architecture stand under foreign influences, mostly Italian, French and Netherlandish. The period of the Spanish Renaissance closes about with the reign of Philip III. (Died 1621).

The most important monuments of the early Renaissance are found in northern Spain with few exceptions. There the Plateresco developed in luxuriant abundance its splendid magnificence on portals and cloisters, as well as on the entire external and internal architecture. On the cloister of the cathedral of Santiago de Compostela (begun 1511) quite directly but in the most charming manner, Renaissance friezes, consoles and small columns are interpolated between mediaeval forms. Farther advanced in the cloister of the cathedral of Leon (1520-1550). The facade of the monastery of S. Marcos there, erected by Juan de Badajoz (after 1514) is counted with the noblest creations of the time. The lower story recalls by its pilaster architecture much in the Quattrocento art of upper Italy, the upper story with the candelabra columns and the luxuriant ornamental work over the windows and niches, the Netherlandish early Renaissance. A still richer example of this type is afforded by the beautiful portal to the hospital of Santa Cruz in Toledo (1504-1514) by the architect Enrique de Egas from Brussels. (Fig. 277). On the Alcazar in Toledo one of the chief masters of the Spanish early Renaissance, Alfonso Covarrubias, erected in 1537 the Plateresco northern facade. From him likewise comes the beautiful stairway design and the imposing columnar court of the archbishop's palace at Alcala de Henares (1534), recalling Italian models. Numerous and imposing monuments of the Plateresco style are possessed by Salamanca. The portal of the university (1515-1530) is erected over the two entrances in three stories without windows, as a show piece entirely composed of figure reliefs, arms and arabesques between decor-

decorated half columns and pilasters. Allied treatment is shown by the somewhat later portal of S. Domingo there (1524-1540). Like many portals of churches of this time, it lies in a wide and high arched niche, that affords protection to the fine sculptures against the weather. Palace Monterey in Salamanca is a richly developed palace design (Fig. 280), characteristic of the Spanish early Renaissance. The highest perfection was reached by the decorative style in the unfortunately never completed city hall (Casa de Ayuntamiento) at Seville. (1540-1564). It is nearly the sole work in the South but has a richness and beauty inferior to no contemporary work, and perhaps never again attained. The chief magnificence is shown by the eastern side. (Fig. 281). The lower story here has Composite pilasters, in whose panels rise arabesques in the style of the Italian Quattrocento, the upper story being subdivided, partly by fluted Corinthian columns adorned by garlands of fruits, partly by candelabra columns, the entire facade being supplied with structural members and the wall surfaces with most lavish sculptures and ornamental work.

The Greco-Roman style is shown as the earliest monument by the palace of Charles V (Fig. 278) erected at the Alhambra. This has a rectangular ground plan with a colossal circular columnar court, in which the entablature rests directly on the columns. As on the facades, the Doric order is employed on the lower story and the Ionic on the upper one. As architect is mentioned Machuca, who had charge of the building from 1526 to 1533. After the court and three facades were constructed, the structure remained unfinished. The palace exhibits a clear arrangement, a complete domination of the architectural masses, and sharp, refined and graceful details, that approach near to the architecture of Sanmicheli. (Page 220). It appears in its universal style in the midst of the surrounding buildings and the entire landscape as an expressive symbol of the position in the world assumed by Charles V.

The first church building in expressed Renaissance forms is the cathedral of Granada (page 14.). Enrique de Huesca had commenced the structure on the basis of Gothic lines in the plan as a five aisled plan with six continuous bays and the extension of the outer side aisles around the polygonal choir, but

only the foundations were completed. From 1528 Diego de Siloe (died 1563) led on the building; in 1511 it was dedicated. The architecture remains within the limits of a very severely conceived Renaissance, still under Gothic influences; the vertical lines are strongly accented, the piers are energetically subdivided, not in the sense of the overloading of the Barocco, but in that of a translation of the originally designed Gothic piers into Renaissance forms (Fig. 282). The nucleus of the choir is formed by a central building with ten sides occupying the width of the middle aisle. The vaulting follows with rich, but purely decoratively treated star vaults. Diego de Siloe is also the builder of the cathedral in Malaga (after 1528; Fig. 283), which in plan and treatment frequently recalls that in Granada, but on its visible side differs from that advantageously by the well weighed subdivision of the structure into two nobly treated columnar orders between the front towers. According to the building period the cathedral of Jaen also still belongs to the early Renaissance, begun in 1532 after the plans of Pedro de Valdevira. On it again appears the true national church ground plan (Fig. 249) as a rectangle (223.1×144.4 ft. in the clear) with three continuous longitudinal aisles, a transverse aisle, chapels along the outer side walls and choir end, and two flanking towers in the facade. The architecture of the interior and exterior already bears the character of the style of the succeeding period.

2.3 The high Renaissance had in Philip II a zealous and energetic patron. The king took part personally in the preparation of building plans, and also interfered directly in the superintendence. Already in the first years of his reign, he commenced at some 210 miles northwest of Madrid and at the foot of the Guadarrama mountains his principal creation of the Escorial (Fig. 284). In it he established in 1533-1581 a colossal structure, that was to combine the church (S. Lorenzo), monastery, royal palace, library, Mausoleum and picture gallery. The ground form is a rectangle with sides of 524.9 and 656.2 ft., enclosed by four wings of the building, that on the entrance side showing a richly subdivided frontispiece. The two side wings continue in a single line for each, but the rear

one is broken by the choir of the church. The angles are accented by low tower-like structures. The church lies on the main axis and is a central building over a Greek cross with a vestibule between two front towers. By parallel and transverse divisions is produced a great number (16 in all) of rectangular internal courts, all surrounded by arcades on piers of columns. As architects were employed Juan Bautista de Toledo (died 1567), and after him his great pupil, Juan de Herrera. (1530-1597). Both had received their training in Italy (Naples and Rome), whereby is explained the architectural forms entirely in the Italian character. The church of the Escorial (Fig. 285) is Herrera's own work. Likewise Vignola, Alessi and Tibaldi must have furnished designs. The Escorial was called in its time the eighth wonder of the world. It is perhaps the largest architectural undertaking ever conceived and executed by a single man, indicating the royal nature and personality of Philip II, whose spirit of rigid etiquette, sullen nature, gloomy and petrified religiosity, are expressed by the work, but otherwise is without great importance in the history of art. Soon after the completion of the Escorial, the king commenced another great structure in the north of Spain, the cathedral at Valladolid. (After 1585). Juan de Herrera designed for it a grandly conceived plan in the basal form of a rectangle 452.7×229.7 ft. in the clear, with dome and four angle towers, but he was compelled by lack of means to prematurely terminate the construction, after scarcely one half was erected. Herrera was the most important Spanish architect of the 16th century and the supreme architectural official of the country. His exchange (bourse) at Seville (1584-1598), a rectangular structure, its exterior simply subdivided by wall strips and Tuscan pilasters, enclosing an impressive two story court with arcades on piers, treated entirely in the Palladian sense, and which might as well have stood in Vicenza. For the castle in Aranjuez in the midst of an incomparable landscape, already commenced by Toledo (1561), but stopped on account of the erection of the Escorial, Herrera designed in 1571 new plans at the command of the king, whose execution was then begun. But the master did not live until the completion.

The severe academic tendency introduced by Juan de Herrera influenced nearly all buildings at the end of the 16 th century and even prevailed at the beginning of the 17 th century.

IN PORTUGAL the early Renaissance is characterized by the "Manuelino style" (estilo Manuelino; page 146), whose chief work is formed by the monastery of Batalha near Lisbon (page 148) founded in the year 1500 by Manuel the Great (1495-1521). The magnificent portion of this singular architectural work is the cloister represented in Fig. 286, by Joao de Castilho and built before 1550, perhaps the most beautiful, in any case the most magnificent of all monastery cloisters. Until after the middle of the 16 th century the Portuguese adhered to the art style of their best period. Indeed about from 1533 onward became perceptible a stronger infusion of Renaissance with the loggia of the Capellas icparfeitas at Batalha. (Page 147). But it did not attain an entirely national development and maturity, since the country had fallen deeply into decadence under the successors of the great king. About 1570, Filipppe Terzi of upper Italy came to Portugal, indeed on invitation of the Jesuits. The king Sebastian appointed him in 1572 architect of the royal palaces; later he also became architect of the fortifications. Terzi erected numerous buildings in Lisbon in very pure forms of upper Italy, among them the church of S. Vicente de Fora (after 1590), whose facade exhibits on a high lower story three intervals of a great Doric order, above being a Corinthian order, and flanked by two low towers.(Fig. 287). A series of other structures were partially or entirely destroyed in the earthquake of 1755. Likewise in Coimbra, Porto and Thomar, Terzi was engaged on great buildings. He was the architect of the developed Portuguese Renaissance, who exerted a controlling influence upon all masters employed in the country in that period.

3. RENAISSANCE ARCHITECTURE IN FRANCE.

I. Historical Evolution and Style.

More closely than in any other country outside Italy does the art succeeding the middle ages cling to that of the Italian Renaissance. Indeed likewise here, as in all northern countries, had the soil proved itself particularly adapted to the Gothic. But otherwise in France the basal conditions for the acceptance of Renaissance forms were substantially less favorable, than elsewhere. The French are an artistically gifted mixed Romanesque people, that was derived from at least three great races, the Gauls, Romans and Franks, and stand infinitely nearer the Italians in derivation and character, than the other nations of the West. In the formerly Roman provinces of southern France the antique had exercised a direct and deep influence upon the entire civilized life and had left behind numerous monuments, which must have affected the artistic designs of the Romanesque population there preponderating in a manner similar to that on the racially allied Italians beyond the frontier. Likewise in the climatic, regional and general conditions of life lay many analogies, which produced necessarily the same expressions in the art works. And even if the assumptions are faulty, the evolution of the French Renaissance would have been completed internally from these bases, in entire independence and without foreign influences. It required far more deep and continued impulses, before the French Renaissance reached its development and maturity. These impulses started at the end of the 15th century from an event of political history, by which the French monarch and the great men of the country learned to know the architectural works of the Italian cities, by the campaign of the army undertaken by Charles VIII (1483-1498) to Naples in the year 1495, in order to protect his right of inheritance. The splendid Italian churches and palaces made a deep impression on the king and his knights. He conceived the plan of erecting similar buildings in his own country, and further called to France in the same year a series of Italian artists, among whom were Fra Giocondo of Verona (page 212) and Domenico da Cortona. His successor Louis XII (died 1515) continued his endeavors, and Francis I, a powerful

monarch and a zealous promoter of art and science, who had also among others secured the theorist of Serlio from Bologna (page 229) for his service, systematically carried on his buildings the Italian Renaissance with all its consequences. Thus it was the court and the second line of nobility dependent thereon, who appeared as the supporters and spreaders of the Renaissance in France. Thereby it received there this predominating character of the court. Its entire evolution was determined by the reigns of the different kings named. Therefore the French also designate the different periods after the names of their monarchs. Since the formative arts first of all have to serve for dignified representations and personifications of the royal powers, architecture takes the leading part. Painting and sculpture appear in a condition of dependence upon it.

Until the end of the reign of Francis I (1545) continued the period of transition from the form world of the middle ages to the matured new style. Therefore we have placed the French early Renaissance from about 1500 till 1545. The chateaus of this time permit the recognition of their development from the mediaeval castle. They still form irregular architectural designs, that are surrounded by a wall and moat, contain one or more courts, and the main buildings are so arranged, that they are grouped around a great court, the court of honor, with three or four wings. Outside this architectural group serving for the use of the court, is found the subordinate court (basse cour) intended for the housekeeping. At the various angles of the chateau stand towers, which are still mostly round, yet have already lost their purpose of defense and serve as living rooms (Fig. 288), at the corners of the main court being smaller stairway towers. The private palaces located in the cities (termed "hotels" in France) generally show a simplification of the chateau design at a smaller scale, and with the omission of the arrangements intended for defense. They were placed away from the streets if possible, separated from them by a court with a high enclosing wall. A rich facade was exhibited by the city halls as a rule. With the conservative sense of the cities, these were still exclusively Gothic until in the second quarter of the 16th century, but then occurred Rensis-

Renaissance forms in luxuriant magnificence.

The simple houses of the citizens are mostly half timber structures with narrow house entrance and wider arched opening for the shop or the workshop in the ground story, and coupled windows in the upper story serving for living rooms. The church architecture of the early Renaissance retains the Gothic design in ground plan and structure even with the buttress system, translating the detail forms on buttresses, flying buttresses, finials and parapets directly into Renaissance forms. (Figs. 189, 299). The windows frequently retain Gothic subdivisions, even in chapels of chateaus. In secular architecture (Fig. 290) in place of pointed arches occur round arches, depressed arches, and particularly common are straight arches (horizontal lintel with rounded corners). The windows are made large and mostly receive a stone cross for a rectangular light area. The battlements are replaced by perforated galleries. An expressed preference for high and steep roofs, for numerous and splendidly treated dormers (roof windows) and for colossal and harmoniously treated mantles appears everywhere as a natural peculiarity, that has in great part been retained to the present time. The evolution of the style of the French Renaissance is extremely interesting, but it presents no unified representation. One could select an entire series of schools, that exhibit a special character of the style corresponding to the diversity of the provinces and their population. But in general may be recognized two chief tendencies, the Italian-Antique and the Gallo-Frankish. The former directly results from the influence of the southern French-Antique and of Italian art; the latter is rooted more in the native Gothic. Its sources are also in a far less degree than those in the classical architectural works of the South and of Italy, for whose organism were at first little accessible the art forms of the Gallo-Frankish portion of the population, still controlled by mediaeval opinions. It was derived much more from intarsias made in Italy, book illustrations and the like, in Italian original drawings, copper engravings and bronze tablets, and in these was it that the new mode of decoration, in particular the animated ornament as it appeared in the Quattrocento

art of upper Italy, that held the French, inclined toward too rich and animated decoration. Thus arose an uncommonly picturesque transition style with mixed Gothic and antique forms, that was gradually purified with the increasing understanding of the nature of classical forms, finally turning into the paths of Italian-Antique art, yet in harmony with the national keynote. A particular pleasure in luxuriant sculptured and ornamental decoration then still belonged to it. The ornament may be deduced in nearly all details from that of the Italian Renaissance, especially from that of upper Italy, but by the art taste of the French constantly directed toward the ornamental and graceful, it receives by the abundant use of figure medallions, coats of arms, symbols and monograms an original development with a very fanciful and refined execution. (Figs. 288, 289). The ornament of the early Renaissance only remains in use until about 1530; thenceforth prevails, at least in the internal decoration, the grotesque (page 190) under the influence of the school of Fontainebleau, which was spread over all France by native ornamental engravers.

The French high Renaissance (about 1545-1580) commenced with about the accession of Henry II (1547-1559). Already under his predecessor had France taken a mighty advance. The capital Paris became the centre of intellectual and artistic life. It also assumed the role of leader in art and maintained this in the entire succeeding period. The provinces remained backward in the development, particularly those of northern France. A series of important artists, trained in Italy, sought to bring into severer use the classical laws of form learned there, and to purify the architecture of their native land, but still retain certain national tendencies, which gives to French art its peculiar expression. In the style became perceptible an endeavor for greater regularity, definite architectural lines, symmetrical distribution of the structural masses and an emphasizing of the chief points. On the noble architectural works the angle towers were transformed into pavilions of rectangular design, and the chief axes were accented by projecting and raised central buildings; the stairways were removed into the interior and received straight flights with landings. In the

structure (Figs. 292, 302) remained the steep roofs, the dormers and also frequently the great rectangular windows with stone crosses. The dormers were usually arranged directly beside each other, so that they form a continuous attic story. Likewise the upper windows not seldom interrupt the main cornice. Over these generally rise triangular or round-arched caps, frequently arranged alternately beside each other, as the upper termination of the facade. Herein as well as in the arrangement of the corner pavilions, the steep roofs with dormers and monumentally treated chimney caps lies the individuality of the French high Renaissance. In the facade system was skillfully utilized the combination of the two stories in one order. The forms of details permit the individualities of the different artists to be plainly recognized. A new phenomenon is the "French order", on which richly ornamented bands covered by rustication are inserted between the separate drums of the shafts of columns. (Fig. 291). In general becomes apparent a greater enjoyment of decorative richness; particularly in relief ornament, in the common use of hermes and caryatids, than in contemporary Italian architecture, and likewise a certain tendency to refinement of all details. Yet is also expressed in this the prevalence of a theoretical direction, such as occurred in the literary works of different masters.

The chateaus lost all remembrance of the former fortifications, the wall, defensive towers and the like. They received a regular plan around one or more courts, if they did not have to take into account already existing structures. For smaller works the court mostly approximates the square ground form. In other private architecture likewise appears an endeavor for regularity and purity of the forms of the style. Church architecture in this period remains very backward in the acceptance of the Renaissance. Only on the portals and in the treatment of the facade does it secure a greater influence. But in the interiors of churches definite Renaissance forms first found entrance with the beginning of the 17th century.

In the last decades of the 16th century French art was no longer free to develop itself under the unfavorable times, the frequent changes on the throne, and the violent religious and social wars. Under Henry IV (1589-1610) indeed again appeared

better times. But the king saw more important **problems** in measures for increase in the welfare of the people, in the construction of streets and canals, the correction of entire quarters of the city, and in the provision of open squares, than in the erection of chateaus. A certain tasteless but intelligible conception then obtained supremacy in architectural creations. Men preferred ashlar work for itself, carried out rustication on all the stories (Fig. 293), but resorted to brickwork to a greater extent, then employing cut stone only for the enclosures of the doorways and windows, the angles and cornices. The Ionic and Corinthian orders lost their preeminence to the Doric. Particular attention was devoted to rustication; it was designed with ornamental decorations and with sunken lines interlaced like worms. * On the whole men resorted to the effect of the masses, which also appears in the most swelled forms of ornamental work. The contemporary Italian **art** won a greater influence; the stone cross and mullion disappeared. The internal walls and ceilings received in increasing measure moulded enclosures in relief, within which were placed paintings. But in the **designs** of buildings, the angle pavilions, steep roofs and high chimney caps **were still retained** the national tendencies.

** Rustication always served to emphasize the strength and stability on the horizontal corners of substructures, on vertical supporting members like the angles of walls and their openings, and even on pilasters and orders of columns, frequently also for purely ornamental purposes, for the animation of facades, as a transition from the horizontal to the vertical, and as a contrast to the orders and their vertical tendency. It is particularly found on great chateaus, palaces, city gates and the like, but less on private houses. It is but exceptionally found on churches.*

For this period of the French late Renaissance can scarcely be given an appropriate time limit. The changes are in time and style too variable and indefinite, and if important writers regard the entire age of Louis XIV and XV as belonging to the Renaissance, there may indeed be mentioned for them as many reasons, as for the acceptance of another, that in general

one may not speak of a French late Renaissance, since the high Renaissance passed directly into the Barocco. But it cannot be denied, that after the deaths of the great masters of the high Renaissance, and particularly with the reign of Henry IV, a changed conception appeared in architecture, which in comparison with the high Renaissance shows a decadence in development, and that on the other hand with the time in which the great statesman Richelieu took the rudder of the state (1624), and introduced his energetic measures for overthrowing the ancient feudal nobility, and for the erection, strengthening and glorification of an unlimited royal power, a new spirit, that of the Barocco, penetrated into architecture, particularly into internal architecture. Therefore we date the late Renaissance of France from about 1580 to about 1625.

In the course of the French architecture of the late Renaissance appeared two tendencies, that were already prepared in the high Renaissance, even with little definiteness. One of them represents a severe conception of architectural forms in the spirit of the antique and of the Italian theorists Vignola and Palladio; the other saw its models in the works of Michelangelo, of Alessi and of Ammanati and created its buildings in a free manner, frequently influenced by Flemish art. We have herein a reflection of the two main currents, that dominated the religious and political conditions of France at that time. In fact the severe classicism was chiefly defended and spread by the Huguenots. Both currents then proceed in France beside each other, sometimes combine and frequently refine and free the art designs on both sides. The unity and similarity of the artistic expression, that formed a distinctive mark of the later French art, was first attained in the time of Louis XIV, but it then appears as a piquant mixture of a severe academic classicism and a free and unrestrained Barocco.

2. The Most Important Monuments.

After the reign of Louis XII the chateau architecture stands in the foreground of artistic creation. In it was developed an extraordinarily animated activity. Today more than 30 chateaus may be counted, dating from the 16th century and in great part famous, that were not infrequently laid out on such a

a colossal scale, that they never came to completion. Many fell a sacrifice to the storms of the revolutions. With the abundance of monuments in the region of the Loire, especially preferred at that time, in Normandy and the south, we can only here refer to the most important works.

The early Renaissance took its start from the chateau at Amboise. There had been settled since 1495 an Italian colony of artists. From their cooperation with native masters proceeded the first French Renaissance on the Loire and at Gaillon. Among the Italian masters Fra Giocondo (called in 1505 by Pope Julius II to participate in the competition for S. Peter's), and after him Domenico Cortona (the latter participating on the chateaus at Blois, Chambord, Bury etc.) exercised great influence on French architecture. The chateau at Amboise is an imposing complex of buildings, enthroned on a high terrace above the Loire and guarded by massive round towers, on which only certain portions of the structure date from the end of the 15th and the beginning of the 16th centuries. On the eastern wing of the chateau at Blois erected by Louis XII, whose history extends back into the time of the Renaissance, the facade exhibits very remarkable Renaissance forms. Richer decoration in the spirit of the Renaissance is borne on the northern wing, built by Francis I at the beginning of his reign, whose court facade with the magnificent winding stairway (Fig. 294) indeed forms the most beautiful work of the French early Renaissance. About 1520 the same prince commenced the grand chateau of Chambord some miles north of Blois (Fig. 295) as a regular plan with a principal building on a rectangular ground area, four mighty round towers at the angles and a detached stairway tower erected over the middle of the court (?) (with the famous double winding stairway, on which those ascending and descending did not meet), whose termination by a lantern rises above the unusually animated outline of the roof. As an architect of this chateau is named Pierre Nepveu. At the same time Francis I erected near Paris the hunting chateau of Madrid, a smaller rural residence, on an elongated rectangular ground plan without a court. The formerly proud but now completely demolished showy building had in its somewhat recessed

middle part, in the two lower stories being open round-arched arcades with terra cotta (by Girolamo della Robbia from Florence) in the spandrels of the arches, above these being also two enclosed stories with developed and noble Renaissance forms. The brick structure of the chateau of S. Germain-en-Laye near Paris, rebuilt in four stories about 1530 by Francis I on earlier and entirely irregularly arranged foundations, is severe and simply treated with a strong accenting of verticals by buttresses, the whole with a massive impression, almost like a fortress. As the darling creation of the architecture-loving king is to be regarded the chateau of Fontainebleau. In it was established a palace of immense extent and truly royal magnificence with an irregular grouping by retaining older parts. But in reality its artistic importance is exceeded by its historical. The chateau was frequently rebuilt and thereby lessened its unified effect. The exterior is comparatively simple with a thorough approximation to the Italian arcaded construction on piers with projecting pilasters and columns; but the interior was treated with extraordinary richness. The most important rooms from the early Renaissance are the ballroom and the gallery of Francis I. The ballroom (Fig. 296) is manifestly influenced by the style developed in Italy and cultivated by Giulio Romano (page 218), wooden paneling, stucco, reliefs and painting being employed in the richest measure. It is indeed the most nobly treated and distinguished interior of the time of Francis I. The gallery is 190.3 ft. long, comparatively narrow and low, and in the prominence of luxuriant panels, of cartouches, of figure and ornamental decorations, already permits the decadence of the style to become visible.

With these royal chateaus the country seats of the nobility do not keep equal pace in regard to the evolution of the Renaissance. In them the mediaeval forms are influential longer than in the former. First during the reign of Francis I on the chateaus of the nobles the basal traits of the feudal castle were gradually supplanted by attention paid to convenience, a comfortable and cheerful equipment. A very important early work is that of Cardinal George d'Amboise, the art-versed statesman of Louis XII, a zealous patron of the Renaissance, who built after 1502 near Rouen the unfortunately destroyed chat-

chateau of Gaillon, from which remains a drawing by Du Cerceau and the portal of the inner court, now set up in the court of the ecole des Beaux Arts in Paris. Guillaume Senault, a French master designed the plan for the main building and labored on its execution from 1502 to 1507. The new building adjoined the irregular and already existing castle; but the principal court was already arranged in octagonal form and surrounded on three sides by pier arcades. The architecture had great richness in the gay ornamental work of the early Renaissance. Entirely preserved in its original condition is the chateau of Chenonceaux near Blois, erected 1515-1555 on the river Loire and partly on a bridge across it.(Fig. 298). The chateau proper ~~has~~ a square ground plan without a court. The angles have slender round towers, and the chapel and library adjoin the nucleus of the structure. Here mediaeval and Renaissance forms were employed directly beside each other. The windows have late Gothic enclosures, heavy hermes before the middle jambs and Renaissance pilasters at both sides. Grand was likewise the chateau of Bury, also near Blois and built after 1515, a regular plan with square court of honor and rectangular garden behind the main building, evidence of whose splendor is given today only by still massive remains. Of the water chateau of Chantilly near Senlis, the main building from the time of Francis I is grouped irregularly around a triangular court, but later and about the middle of the 16 th century, it was connected by a bridge with an outer court and garden surrounded by service buildings, and on the other side by a second bridge with the great agricultural court and other plans of gardens. The architecture of the portions of the building erected in the time of Francis I with all their richness already permit the recognition of a plain endeavor to simplify the forms in the sense of a severe observance of the classical laws of form. Extremely numerous and important monuments are contained in Touraine.(The river region of the Loire in regard to its development in the history of art may be compared with that of Tuscany in Italy, and likewise Normandy by the lavish decorative treatment of the architectural works with upper Italy). The chateau of Chateaudun near Orleans, restored from 1502 to

1532 without ever being completed, exhibits in the facades only a few Renaissance forms, but it has a winding stairway included in the mass of the building, which scarcely finds its equal in grandeur and as a structural work. The chateau of Lu-de (Fig. 288) was begun in 145, and rebuilt under Francis I, completed in 1535, by clear simplicity in the ground plan and extraordinary refinement in the treatment of the details, affords in its entire appearance a harmonious representation of the self-conscious and defiant supremacy of the higher French nobility, appearing in graceful and dignified clothing. Likewise the remaining numerous chateaus of the French early Renaissance have the mixed style resulting from national and Italian architectural principles, which unfolds its picturesque charm on the always preferred court facades.

Among church buildings (page 248) the choir of S. Pierre in Caen, built 1518-1545 by rector Sohier, presents one of the most interesting examples. It is still arranged on the Gothic cathedral system as a polygon with choir aisle and circle of chapels, constructed with buttresses, flying buttresses and finials and the like, but otherwise entirely clothed in Renaissance forms and ornamental work. (Fig. 297). Also S. Eustache in Paris, begun in 1532 by Pierre Lemercier, has an entirely Gothic design, directly translated into Renaissance forms (Fig. 299), but on the exterior Doric and Corinthian pilasters with triglyph frieze (the magnificent double colonnade of the facade is from a later time.) Fully expressed Renaissance forms were received by the facade of the Gothic church of S. Michael at Dijon with three great round-arched portals and two towers, subdivided by four orders of pilasters between bold buttresses and crowned by octagonal domes.

Among the city halls are to be emphasized those of Paris, Orleans and Beaugency. They indeed still retain the former internal plan (page 154), but with a stronger accenting of the vestibule and stairway. Instead of the belfry occurs a small clock or bell turret. The facades are enclosed and furnished with pilasters and their cornices and with the new ornamental work. Of the prominent city houses the Hotel Ecoville (about 1530) in the picturesque old city of Caen presents a model ex-

example with charming arcaded court, around which are grouped a great hall and the living apartments, and with a facade of extraordinarily beautiful proportions. Interesting in style is the house of Francis I at Paris, erected in 1527 in the village of Moret near Fontainebleau, later transported to Paris and set up in the Champs Elysees. (Fig. 300). It is an architectural ornamental piece of unusual magnificence. Numerous Renaissance houses, both stone and half timber structures, are still found in Orleans, Bourges, Rouen, Angers, Caen, Viviers etc.

At the transition from the early to the high Renaissance, we have to consider an architect, who has transmitted to us a knowledge of French chateaus by his architectural drawings, Jacques Androuet de Cerceau (1510-about 1585). He chiefly became known by his rich activity in art literature, was a refined and educated artist, but scarcely appeared practically; at least no important architectural work can be attributed to him with certainty. In the year 1550 he designed an ideal plan for a chateau, that still entirely exhibits the loose connection of the separate structures of mediaeval castles in plan, but these are entirely clothed in Renaissance forms.

The high Renaissance (page 249) is characterized by the chief works of two great masters of French architecture, which definitely influenced its development. The first of these works is the Louvre. Shortly before his death, Francis I came to the decision to erect an imposing new structure on the site of the old mediaeval castle, that he had torn down. He entrusted this to the refined Pierre Lescot (1510-1578), born in Paris and educated by the study of the antique architectural monuments of Rome. He planned a design with four wings having middle and end pavilions, grouped around a square court. (Fig. 301). Of this the master, who had charge of the building from 1546 to 1578, erected the southwest angle (Fig. 30.). As the facade system he employed on the inner and richer court side (the external facade toward the Seine exhibits great simplicity) two Corinthian orders, the lower one with an arcade, between which lie the windows and doorways. Above the latter he arranged the round windows, which later attained to such great favor and were termed "ox-eyes" (oeils de Boeuf). The upper

with windows having caps, above which was an attic treated as a half story. The roofs on this wing are low and the chimney caps project but little. Only the pavilions make an exception from this. It received above the half story further an upper story with the height of the principal story and with high round-arched windows and a great roof with monumental chimney caps. His system of the facade was regarded as a model example of festal palace architecture and was frequently imitated on numerous buildings in the succeeding period. The richly sculptured ornamentation was by Jean Goujon (died about 1555 in Italy), France's greatest sculptor, but who was likewise thoroughly acquainted with architecture, and was in part practically employed as an architect. Lescot was a highly cultured artist in refined design, who understood how to combine all elements of architecture in the noblest treatment for the highest magnificence. His court facade of the Louvre appears as the ripest fruit, that the Renaissance produced on French soil after the purifying of the capricious art of Francis I by the classical feeling form.

The second great master of the French high Renaissance is Philibert de l'Orme (about 1514-1570), quite differently equipped in comparison to Lescot, yet no less important and even better known from his many-sided activity as architect, engineer and theorist. After a long stay in Rome already commencing before his 20th year, where he measured and drew the antique architectural monuments, he returned to France about 1536, and was there first employed as a fortification architect, and in 1548 entered the service of Henry II, who appointed him the upper superintendent of the most important royal buildings. One of his early works is the chateau of Anet (after 1552), in great part destroyed in the revolution, and which Henry caused to be built for Diana of Poitiers. This work is the most original work of the master, an entirely uninfluenced creation. The principal building is grouped around a square court to which leads an imposing gateway (Fig. 303). The columnar orders are here employed, still entirely in the character of the Italian Renaissance. About 1564 de l'Orme received from queen Catherine de Medici the commission to erect before the gates

of Paris a new chateau, the Tuileries (so-called from the tile-works located on the site), in the vicinity of the Louvre. The master designed a ground plan as an enclosed rectangular design with an imposing main and four smaller courts. (Fig. 301). The construction began with the middle pavilion of the garden facade in massive proportions and in the greatest magnificence. On the facade (Fig. 292) he employed the "French order" invented by him * and described in his principal work. (Page 251). The pavilion received two high stories with Ionic columns in the lower and Corinthian pilasters in the upper story, above this being a half story with small round windows and a dome with a crowning lantern as a roof. The adjoining wings were one story arcaded buildings on piers with a roof story treated as an attic, on which high windows were arranged on wide and low bases in rhythmic alternation, so that the facade received a very animated crowning line. De l'Orme, besides being an architect, also as a learned theorist developed a very abundant activity. He was a distinguished constructor. By means of the system for roofs named after him, he spanned halls of entirely unusual width, indeed by a well calculated joining of timbers in a great arch, thus a method of construction generally employed 300 years later for great railway and exhibition halls. De l'Orme wrote several valuable works on architecture, among them also two books on stonecutting, that for a century formed the best and almost the sole treatise on the subject.* * In artistic respects in comparison to Gescot, he inclined toward a dryer and more Barocco conception, to broken entablatures, intersections and a freer loosening of the members, while Gescot excelled him by nobility of forms and refined feeling for proportions and the forms of details.

* Actually the order "invented" by De l'Orme is merely a more tasteful form of the columns and pilasters with rusticated bands already employed by Sanmicheli.

* * In France the enjoyment of technically perfect solutions and perfection in execution led to a refinement in technical procedures in all domains of architectural construction (as polishing the surfaces and mouldings of ashlar and cornices), and to a very high development of the science of stonecutting,

that branch of architecture, which concerns the fixing of the bond and the size and form of the different stones for heavy construction (particularly at intersections of vaults, in stairways and the like), with regard to the laws of statics. Thus straight arches (horizontal lintels composed of voussoirs) and trumpet vaults became more common in France than in other countries, and indeed were executed in a masterly way, the latter as conical or spherical vault pendentives beneath projecting parts of the building, for example when angles of the structure of the upper story project above angular corbellings from the ground story.

After the death of De l'Orme (1540) Jean Bullant (1515-1578), who resembled him in literary activity and also in many other respects, carried on the Tuileries further, and likewise in his youth had made studies of the antique architectural monuments of Rome. He entirely retained the conception of De l'Orme, but was compelled to cease his work after two years, since the queen stopped the building of the chateau in the year 1572 for superstitious reasons. The pavilions of the two wings of De l'Orme's structure executed by him are later, and like that are so greatly transformed -- and not to their advantage -- that one can scarcely longer recognize his participation. Bullant was the builder of the chateau of Blois located some miles north of Paris (about 1531-1564), that belongs to the best works of the French high Renaissance. The chateau was commenced by a master otherwise unknown, Charles Billard or Baillard. Its ground plan shows a great square court, surrounded on four sides by comparatively low wings, the front one of these being treated as an arcade gallery opening inward. At four angles stand boldly projecting pavilions, that in the facade at the left forming the chapel. By small and unsymmetrically added small stairway towers in the angles of the pavilions, the strong accenting of the dormers and chimney caps, as well as the quite mediaevally divided windows of the chapel, the chateau received a waft from the spirit of the French Renaissance. The interior (Fig. 304) had a splendid equipment, as contemporaries and later writers emphasize with praise, but it was in recent times strongly restored, like the entire chateau otherwise.

The remaining secular architecture further produced a series of important chateaus by workmen or less important architects, who adhered in design and details to the chief tendencies developed by the great masters and to their models. Among the chateaus of the nobles of this time is to be mentioned the chateau of Verneuil in Picardy, as prominent in magnitude and splendor, a work of Jean Brosse, that consists of four wings enclosing a square court with strongly emphasized angle pavilions and a heavy portal structure, showing in the architecture a free treatment with the adoption of many Barocco elements. (Fig. 305). The citizens' dwellings generally preserve the traditions of the early Renaissance in regard to their arrangement, but show the character of their time in the forms of the details. Important works in church architecture in the French high Renaissance are not to be specified.

The late Renaissance (page 252) receives a heavy and dryer character no longer fully corresponding to the French art spirit, by the prevailing tendency for striving after severe regularity and simplicity and the repression of the rich external decoration. Indeed the portions of the Louvre erected by Henry IV, the grand gallery by which a connection with the Tuileries was produced, still exhibit a royal magnificence, yet without ever attaining the artistic height of the buildings of Francis I and Henry II. As the architects are mentioned Baptiste and Jacques du Cerceau, sons of the previously mentioned Androuet, as well as Thibault Metezeau and his son Louis. The stag gallery of Fontainebleau, by the combination of brickwork with ashlar and the entire treatment of forms, bears a tasteless impression. In Normandy, where the brick architecture of the middle ages was at home, this combination rises to a rich and peculiar artistic development. (Chateau of Beaumesnil in Department of Eure). The most distinctive work of the late R Renaissance is palace Luxemburg (1615-1620), erected in Paris for Maria de Medici by Salomon Brosse, the principal master of the time, a building composed of one elongated wing with a great gallery (for which Rubens created the famous paintings) and four strongly projecting angle pavilions. The external architecture adheres to the Florentine conception of Ammanati,

indeed particularly to that of the court of palace Pitti (compare Figs. 283, 289). Likewise in the interior (Fig. 306) the Italian classicism tends to purify the crowded forms of the French Renaissance. The same master was likewise the creator of the principal church of French Protestantism, the chapel at Charenton (after 1606), a Huguenot structure in the form of an antique basilica (volume 1, page 117), and the facade of the Gothic church of S. Gervais at Paris (1616-1621), on which he employed the three classical orders with severely classical treatment for a powerful and indeed purely decorated building. (Fig. 307). Debrosse was a Huguenot, and as such was already inclined to a severe conception of architecture in the sense of a purely intelligible classicism. His ground principles were even made more severe by the requirements of Calvin, who for a long time exiled all sculpture and painting from churches. But otherwise secular and church architecture, besides the tendency pursued by it, adopted a second deviation therefrom, that indeed adopted the same basal elements, but in contrast to the simplicity there intended for show, frequently took to Barocco forms and often to luxuriand overloading. But always is it the genuine national spirit, which prevails in these works, producing that interesting combination of French classicism with Italian Barocco art, from which the art of the succeeding period arises.

IV. RENAISSANCE ARCHITECTURE IN GERMANIC COUNTRIES.

1. General Basis and Style.

The earliest influences of the Italian Renaissance upon the architecture of Germanic lands became perceptible in the first decades of the 16th century, even if only isolated. Against the indeed wonderful acquisitions of the Gothic style, native in these countries, and which included in itself so many elements of permanent worth, completely satisfied the national taste and composed a structural and artistic work of the first rank, the new forms could only advance with great difficulty. The art of the North indeed entered into a new phase in painting and soon afterwards also in sculpture, already at the time when the Renaissance appeared in Italy. But its purpose was one different from that of the South, as also the entire intellectual life was a different one. By humanism the northern art experienced only a slight intellectual advance; the people had no understanding for its learned idealism. Still less could be stated for it as a "revival of the antique", Antique culture was not at home in the northern lands. The mighty impulses proceeding from their architectural and art monuments, most northern artists could not receive at their source. And if this were the case, they scarcely passed beyond upper Italy. The architecture of the southern countries did not become known to them by their own observation. Thus it was far less the architectural works of the antique, than those of the still undeveloped art of upper Italy, that transmitted the new circle of forms to masters advancing beyond the Alps. But even this relatively favorable opportunity could not be utilized except by a small portion of the path-breaking masters in the North. The great majority of them were referred to a different intermediary. And this first followed from the buildings erected in German lands by Italians. In numerous cases Italian masters entered the service of monarchs, particularly in Austria and in south Germany as far as the Slavic east, who were in more intimate relations with Italy by relationship or by church connections. According to whether these masters also superintended the execution or only furnished designs, which were then carried out by northern masters, the Italian art

spirit was expressed in a purer or a weaker form. Certain works are kept so purely in the Italian sense, that only the location separates them from the works of the Italian Renaissance. A further intermediary of the Renaissance for the northern masters was through France. But in this way its purport and characteristics had been much changed by the French interpretation; its motives had lost the clearness and sharpness of the original impression.

Of greater importance for northern architecture was the circumstance, that the Renaissance forms were first adopted by painters for the backgrounds of their paintings, and particularly by copper and wood engravers, being scattered in numerous engravings and prints. The frequently hasty and misunderstood sketches presented by these, whose authors mostly obtained the motives only at second or third hand, were for the great majority of masters in German lands the chief sources of their knowledge of the "antique-like" forms. To these were added other products of the minor arts, that were introduced from France and Italy, utensils, furniture, intarsias, Italian prints and the decoration of books. Therefore it was no wonder, that northern architecture from the first had a tendency to the small; it was hampered by its birth from the art industries. To a higher and grander conception of the Renaissance with its great problems of the treatment of interiors, as these were for solutions in Italy, and to its clarified architectural organism the northern master never soared. There was lacking to them just as much in understanding as in training for Italian art. The writings of Vitruvius were indeed received with interest. Already in the year 1539 a Netherlandish master, Pieter Koek of Aelst, published the handbook of Vitruvius, and soon afterwards those of Sebastiano Serlio were issued in 1548 by W. Rivius, a Nuremberg theorist, thus at that time when men had already advanced in the knowledge of the new world of form, the first German translation of the five books of Vitruvius appeared. Yet men did not penetrate more deeply into the spirit of classicism. The majority of architects, particularly the stonecutters, were satisfied by collecting from wood engravings and copper plates the greatest variety and abundance of

ornamental forms for portals, columns, cornices and the like, in order to interpolate at pleasure this treasure of motives. From such models could not be obtained an assured feeling for the relief of the architectural members, for their harmonious combination in the architectural organism and for the scale of proportions.

These impulses were too far superficial to introduce a complete change in the conception of art and an independent and powerful development. For this were lacking the necessary basal conditions, as well as intensity and uniformity in the impelling forces. The Renaissance forms come from the outside, and indeed at a time when an innate necessity for a reform in style did not exist. With the diversity of the Germanic races of people, it must be accepted with variations. In any case the Austrians, the Franks in south and middle Germany, and the Belgians stood plainly nearer to the Italian mode of feeling, by direct relations with Italy or by their natural gifts and mixture of blood, than the inhabitants of the North. The artists themselves were willing to give up nothing of the structural and decorative acquisitions of the late Gothic, but also on the other hand did not reject the new ornamental forms. They counted not a few masters with rich endowments in their ranks. But such phenomenal artist natures as Brunelleschi and Bramante, who had definitely influenced the entire art of their time, did not proceed from them. The problems to be solved also lacked the character of unity. The princely employers were well inclined toward the foreign influences of culture. But there existed no princely court in the political subdivisions of the Germanic countries, that as in France should have taken a leading part in the art. The imperial cities and the citizen class were conservatively inclined, and from these came most commissions. The church scarcely came into consideration as an important factor in architectural activity. For a need of church buildings only exceptionally appeared after the high advances in Christian art in the preceding period. And then also the religious inspiration of the middle ages, that had found such an elevated monumental expression in the grand cathedral structures, had vanished from the minds of the people.

A democratic feeling of the citizens was devoted to secular needs and appeared in its place.

Under such circumstances could not be the mention of a unified art conception, of unified endeavors and a conscious realization of the new world of form in favor of a characteristic development in style. Even the material had its limits to the transfer to northern architecture. The Italian Renaissance was substantially a cut stone architecture. But in the Germanic countries wooden and half timber construction corresponded to the climate and were native, which did not permit a direct employment of the Italian treatment of forms. For the citizen's house it afterwards formed the most favored system of construction. In the ancient domains of brick construction, brickwork continued in use. This indeed adopted cut stone for portals, window enclosures and cornices, but otherwise its entire nature remained faithful to traditions for a long time. For the more important buildings cut stone certainly was the favorite material. On it the northern Renaissance shows its best effect and its artistic worth; on it likewise most clearly appears the peculiarity of its character.

The style of the northern Renaissance during its entire evolution is not characterized by the development of a definite architectural system, but by mode and manner in which it adopts and employs the new structural members and particularly the means of ornamentation. The northern masters thought first only of a renewal of the worn out ornamental forms for their internal compositions, still created entirely in the Gothic spirit. They at first accepted from the Italian Renaissance only what seemed most striking to them, the antique-like ornamental members of columns, pilasters, consoles, dentils, leaf mouldings, egg-and-dart mouldings, pearl beads and the like, and the ornament, employing these innovations, according to their still defective understanding of their organism, in a very loose way on the entirely mediaeval structure of their buildings and parts of buildings. (Fig. 308). The subdivisions by pilasters and their cornices were applied to the facades of quite different proportions, and particularly constructed with much smaller heights of stories, and especially to their stepped gables,

whereby the pilaster was frequently shortened and the other members also experienced numerous alterations. Not only did the gable remain in use above the narrow facade of the house,* but also on the longer side appeared smaller side gables above the edge of the roof, frequently very rich in treatment. Instead of the finials formerly crowning the gable were spherical or pyramidal projections (obelisks). The inclined eaves of the gable (indeed in imitation of the late Gothic oggee curves on the tracery gables) were curved in animated lines; with steps, fancifully curved bands or ornamental work were laid on the projecting angles. Besides the gables are bay windows, that rise over the entrance to the house, at the centre or at the angles frequently extending from the ground, also often in the upper stories projecting directly from the face of the walls as stairway towers, that are irregularly added to the architectural design, and for city halls flights of steps and balconies form the principal parts of the architectural appearance. They were clothed in the new forms and particularly gave to the bay windows an animated decorative and sculptured ornament. In the developed Renaissance the towers are structures in stories, subdivided by pilasters, covered by domes and lanterns. A rich treatment was enjoyed by the portals. For the opening of the portal the round arch formed the rule in the developed Renaissance. The treatment was less architectural than ornamental. The windows mostly remained very simple in comparison with the portals. They terminated with a horizontal lintel, but also in part with mediaeval forms of arches. On their enclosures they long retained the Gothic mouldings, particularly the deep hollows in the jambs, down to about one third their height, and the late Gothic tracery in the railings of the bay windows. Likewise in church windows is this frequently retained, even if with a transformation of the lines and details into the conceptions of the Renaissance. (Figs. 335, 359). In general the architectural and decorative ornament was limited to certain especially preferred structural parts, which thereby received an almost independent importance over the general organism of the building.

** The gable is just as characteristic for the northern house, as the towers for the northern church.*

The forms of the architectural details permit the recognition of a very free treatment. The use of columns became general with the northern masters only in the advanced Renaissance, about the middle of the 16th century. They were not adopted in their classical forms, but all sorts of decorative accessories were given to them. The pedestal of the column already received ornamental decoration. (Fig. 320). The shaft was preferably furnished with overlaid ornamental work in the lower third, the remainder being fluted and not seldom decorated by arabesques (Fig. 319) or even spiral or lozenge patterns, similarly as in Renaissance art. As a rule the entasis is wanting (Fig. 321); on the contrary the frequently swelled and again reduced baluster or candelabra column (Figs. 311, 332), that already occurred in the early Renaissance of upper Italy, (Fig. 212), enjoyed great favor, especially on the bay windows. As a rule the capitals were derived from the Corinthian capital of the Italian Renaissance, yet frequently experienced a truly awkward transformation. In general men were satisfied with a tolerably rude series of acanthus leaves, from which grew the dry volutes. Likewise the pilasters were treated like the columns, often being diminished downward like hermes or they were entirely formed like hermes. The latter also found employment as free supports. The cornices mostly have a careless, heavy and frequently an entirely capricious treatment. The architrave was often profiled like the cornice. Definite proportions for the height and projection of the different mouldings were not adhered to. If one meets with a careful graduation according to fixed canons of form, nearly always is to be assumed the participation of Italian masters or the direct influence of Italian models. Considered as a whole, the northern architectural works of the Renaissance remain far behind the Italian in regard to organic development, unity and in enclosure. Artists of higher standing, who knew the Italian architectural works by personal observation, acquired less esteem for the native architecture, and at least in southern Germany, they sought to present a substitute for it by facade painting, when they covered the plain wall surfaces by a sham architecture animated by figures, or by painted ornamental work.

In the internal decoration likewise the use of ornamental work is less extended over the whole, than concentrated on certain principal parts. The endeavor to first care for a good internal effect is thereby diminished. The great halls of the palaces are mostly very long and low and are therefore out of proportion (Fig. 352); but as a rule they reach a very tasteful harmony by good lighting through grouped windows, by the materials employed, by the color treatment and the charming handling of the details, particularly of the doors, fireplaces, stoves, bay windows and the like. In the technics, decorative arts and the entire art industries, the northern architectural and industrial workers show themselves to be masters of skillful construction, thanks to their strict organization in the guilds. For the walls in both the palaces and also the better houses of the citizens, wood is the preferred material in the form of high panelings. In the anterooms the walls were frequently left white, but the doors received extremely impressive enclosures. (Fig. 313). Wood was left in its natural tint or but slightly stained. The enclosures of the doorways and the paneling in the richer treatment (Fig. 312) have an entirely architectural elevation with subdivision into base, pilasters or columns with cornices and cap like a pediment. Even the rustication is not seldom imitated. (Fig. 313). The bands and framing are then more strongly expressed than in facade architecture. Stucco decorations commonly occur in the palaces toward the end of the 16th century, but first in civic architecture in the 17th century, and indeed mostly in a relatively simple treatment. If the ceilings are horizontal, then occur on them chamfered or moulded beams as in the middle ages. The interspaces are plastered. With a richer treatment were constructed the wooden ceilings imitated from Italy with divisions into panels in the forms of squares, polygons, crosses, stars, rectangles with rounded corners and the like, that are connected together by beams. (Fig. 314). The panels and frieze are frequently treated with animated ornamental decorations. The vaults were at first shaped still as ribbed net and cross vaults, but later as cross vaults without ribs. Secular architecture in general made use of them only in subordinate rooms (ov-

over entrances, vestibules, passages etc.) and they are then The buildings more closely approximating the Italian tendency also employ tunnel vaults and domes. These received ornamental subdivisions with regard to the walls by continuing the pilasters in cross arches, or in addition to the groin lines, or even in an entirely ornamental treatment.

In the interiors of the churches stucco found abundant employment. On the same church buildings, that were still designed in Gothic style, the treatment remained comparatively simple. To the walls was occasionally given an externally conceived decoration, such as developed on the contemporary secular architecture. Renaissance pilasters and half columns, not infrequently commencing at the height of the windows and resting on consoles, bear a main cornice from the rise of the net or cross vaults. (Fig. 315). The ribs were enlarged by egg-and-dart and leaf mouldings, pipes and other Renaissance motives. In the churches, which adhere more closely to the Italian, the pilaster system is completely executed. Also the entire decoration then receives stronger impulses from Italian art. The chief ornament of church interiors lies in the altars, rood screens, pulpits, organ galleries, choir stalls, tombs and epitaphs. They are all clothed in the form system of the Renaissance, frequently rise to a considerable artistic height, and not rarely are of unique beauty. On the choir grilles preserved in many churches also appears the peculiar style of the northern wrought iron technique. It is characterized by round rods rolled in spirals, its numerous passes, by the beating out of the bars at definite and rhythmically arranged places into flat decorations in the form of grotesques and fanciful animal forms, and in the endings of such leaves and conventionalized flowers. (Fig. 316).

The ornament is derived from the Italian, particularly the Lombard Renaissance, that either found entrance directly or through Burgundy and France, but soon begins an independent development, though varied in kind and style as well as in the different countries. The earliest ornamental form penetrating from Italy is the arabesque. (Page 192). The Netherlands and particularly the Flemish early Renaissance adhered so closely to the Italian conception, that for certain works

one might believe, that they were executed by italians. Besides there is general a somewhat dry treatment with broadly pressed foliage and scroll work, that plays around the medalion arranged at the middle and the head forms projecting in strong relief. The same ornament occurs on the dower Rhine and in Westphalia, but there with a somewhat more refined and graceful treatment of forms. In southern Germany the acanthus was partly transformed into heavy and **fleshy** leaf sheaths, the scrolls of dry shape and mostly limited to one turn growing out of vases, dolphins and cornucopias (Basle and Augsburg), partly was it carefully modeled in small and graceful motives, when the acanthus leaf often terminates in small volutes. (Nuremberg). In the treatment of arabesques north Germany is partially dependent on the Netherlands and Westphalia, and partly on south Germany. Besides the acanthus in the northern Renaissance is quite commonly employed a long stemmed and three lobed leaf, borrowed from the leaf outline of the acanthus. (Fig. 317). In the much used sketches of the important Westphalian engraver Aldegrever (1502-about 1555) this leaf forms the basis of the ornament. In the intarsias the ornament changes entirely into a pure flat form and thus to Moresco (volume 1, page 214), which already found frequent use in the Italian Renaissance. (Fig. 318). Nearly allied to the Moresco is the overlaid ornament, developed about the middle of the 16th century and most characteristic of the northern Renaissance. * It consists of linear interlacings widened to bands and very slightly projecting, then connected together by stems and by the nail heads, screws and the like, appearing to be fastened in a manner recalling perforated metal plates. (Fig. 319). If the ends project and are rolled up, this produces the rolled work. (Fig. 320). This finds its strongest expression in ornamental shields, the so-called cartouches, * * where two or more plates are laid over each other, are cut out like overlaid ornaments and appear to pass through each other. Stereometric forms like paneled ashlar, pyramids, sphynxes, spheres, stars, grotesques, masks, lion's heads, garlands of fruits and the like, there serve for ornaments, as also on overlaid decoration. By overlaid and rolled

ornament the foliage ornament of the early Renaissance is almost entirely supplanted. These dominated the minor arts in wood and metal sculpture in the same manner as the ornamental forms of the architecture, indeed until the beginning of the 17th century. Then it passes into the ugly gristbe style,* * * that on its part forms a precursor of the Barocco style and directly leads to that. The painting also makes use of the grotesques (page 192) derived from Italy, for the decoration of ceilings and vaults, more rarely for the ornamentation of walls. Yet the grotesques did not extend beyond the German states (Austria and southern Germany), and ~~there as a rule~~, was executed under the lead of masters, who had received their training in Italy. (Fig. 339).

** As the original creator of overlaid ornament is to be regarded the Nuremberg sculptur, form-cutter and ornamental draftsman, Peter Flötner, with whom the first design originated about 1540. He died in the year 1546.*

** * Cartouche is a pasteboard roll.*

** * * The gristbe style is also denominated "ear muscle" style, since it transferred the scholl-like round forms of the human ear to frame and ornamental work.*

Among architectural works chateau architecture stands in the first rank. In the 16th century was completed the transition from the castle to the chateau; but only in the second half of the 17th century did chateau architecture lose the reminiscences of defensive architecture. At first the chateaus are mostly transformations and extensions of earlier designs. For new buildings the French chateau architecture was in general a model. Larger designs almost always received two courts (lower court as the external, and court of honor as the internal court); on small chateaus men were satisfied with one court (court of honor), around which on three or four sides are grouped the wings of the building. For new buildings regular plans predominated, even if strict symmetry be not always considered. The angles were accented by towers or bold frontispieces. For the arrangement of the ground plans, also more than before was regard for convenience determinative. In the mediaeval castle passage occurred through the

rooms. Now passages were arranged, even if not always. In princely chateaus men intentionally adhered to the rule, that the apartments occupied by princes should only be reached through rooms in charge of servants. In the southern countries the great chateaus mostly have a rectangular arcaded court, where the porticos as corridors form the communications for the rooms. (Fig. 321). But farther north the chateaus have but little corresponding to the Italian palaces. To the creative spirit even there was wanting the grand monumental sense peculiar to the Italians. Only compare certain parts of the old palace at Stuttgart with such of Italian palaces in order to realize how far removed the art conception of the northern masters was from that of the Italian associates in time and in art, how those old and new motives were mingled without restraint and placed beside each other. (Fig. 322). Indeed with all simplicity we cannot deny to their works a strongly picturesque charm. The Italians sought even to elevate the simple dwelling to a palace; but in the North even the prince's chateau retained rather the character of a citizen's house in design and treatment. The ground story was mostly utilized for the official and housekeeping rooms, the second story for the court, and the third for the servants. The most important rooms were the audience room with anteroom, the festal hall and the chapel of the chateau. The number and size of the living rooms were still kept within moderate limits. Besides these and the halls only the vestibule, stairways and entrances were artistically treated in the forms of the Renaissance. But the chateau chapels mostly still remained Gothic until in the beginning of the 17th century. (Fig. 324). The citizen's dwelling in the cities of south Germany, in a rich construction, adhered to the court with porticos, that had already developed in the Gothic period. The ground story contains the business and warerooms. The living rooms are found in the upper story; they frequently have a spacious and tastefully treated anteroom. In the Netherlands, in north Germany and in Denmark, the entrance doorway leads into a high vestibule, the hall, and in narrow buildings into a lobby, that occupies the entire width of the house. Direct-

Directly from the vestibule or lobby a stairway leads to the upper story. This is treated with particular attention, part-as winding stairs, partly as a straight flight. Already early appear picturesque designs. By these and the galleries, which lead to the adjoining rooms of the upper story, the vestibule, already imposing by its height, acquires a very tasteful effect. In city halls the 16 th century is especially rich. They exhibit the endeavors of the cities to impressively treat the seat of the city government. As in the Gothic period, the ground story has large porticos and vaulted rooms for merchants; the upper story, to which a great external flight of steps often leads (Fig. 323), contains the great citizens' hall, rooms for the sittings of the small and the large councils, rooms for writing and for the court of justice. Not seldom is a tower connected with the building, as in the middle ages. The equipment is frequently splendid, particularly in the great hall of the citizens. The universities precede the other public buildings. In their ground plans their original relations to the mediaeval monastery designs cannot be denied. The buildings for commerce and traffic, exchanges, (bourses), granaries, guild houses and the like, are mostly so changed internally, that their original condition can no longer be recognized.

Church architecture did not attain to a proper development in the northern Renaissance. The violent religious wars, that disturbed the period, were as unfavorable as possible to its suitable evolution. Until in the last quarter of the 16 th century and even later in the 17 th century, indeed until the end of the 30 years' war, men adhered in general chiefly to the Gothic character, both in pure external design and in combination with Renaissance elements. The ground form was still the hall church with choir aisle or a simple choir. From about 1530 onward the Jesuits developed great architectural activity. But they did not transfer the plan scheme of the Jesuit church in Rome to the northern churches, as one might believe, but especially in the Netherlands and on the Rhine also built three aisled churches after the mediaeval arrangement. These churches always permit the recognition of

certain greatness in the architectural disposition. Otherwise the northern churches in the majority lack in design and equipment a treatment intended for an impressive internal effect.

With new endeavors Protestantism, arising in the Renaissance period, took up the plan. In the Catholic divine service the offering of the mass forms the most important part of the church worship, in the Protestant the sermon, on the contrary. A suitable arrangement of the pulpit was therefore first to be cared for, and indeed in such wise, that all members of the congregation and from all places in the interior of the church could see and properly understand the preacher. Therefore thought must be taken to give the pulpit as central a location as possible in the interior of the church. For administering the communion was also retained a restricted and indeed very simple altar service. The protestant divine service therefore has two central points, to which must be directed the eyes of the devout, the pulpit and the altar. Men had the problem of so arranging these, that both could be seen well and at the same time, whenever possible. The entire architectural design of the church must be arranged accordingly. The Renaissance never reached a completely satisfactory solution of this problem; perhaps it has not been found to this day, even if some church buildings of the later time have come very near to it. Indeed attempts were not wanting to take the central structure as the ground form of the Protestant church. Yet a definite normal form has never been attained. Frequently the organism remains the ancient one, and only the position of the altar, which chiefly appears as a table simply constructed of stone, as well as the always fixed seats, directed towards the pulpit and altar without regard to any definite axis, and the insertion of galleries with similar seats gave the interior a changed character. In the late Renaissance the hall church with a small altar niche, at whose sides stand beside the altar the pulpit and the font, with the organ gallery at the opposite end, became a commonly occurring form of the Protestant House of God. * The ground plan thus received the form of a rectangle, where the altar

was either placed at one end, whose corners were then generally cut off, or at the middle of one longer side. For this plan the chapel in the old chateau at Stuttgart (after 1533) became typical. (Fig. 324). It consists of a rectangular hall with polygonal bay window niche on the longer side, in this being the altar, beside on the angle of the wall being the pulpit. On the opposite longer side and at the ends are arranged galleries. Thus the requirement was satisfied in a proper manner, that the altar and the pulpit should be seen well from all places.

** Debrosse, the chief master among the Huguenots had chosen for his chapel at Tharenton (page 234) the basilican plan of the antique with the alteration, that galleries in two stories extended around the high central interior.*

To the simplicity of the divine service corresponded a great reduction in the treatment. The artistic effect of these halls for preaching therefore remained far behind that of the religious buildings of Catholicism. Certainly there also originated in the Renaissance some Protestant church buildings worthy of consideration. But Protestantism first aspired to grand and monumental effects in some structures of the succeeding period.

The development of the northern Renaissance shows us, that even in it, as in Spain and France, Gothic and antique ornamental members at first often directly appeared together, were gradually better combined with contemporary additions, and slowly fused together. This mixture of styles in the native art with the new form elements denotes in all countries the character of the early Renaissance. It corresponds in the history of the evolution to the Quattrocento of upper Italy. Its buildings are full of picturesque charm and frequently with an almost overloaded decorative richness. In the course of the 16th century the forms were clarified. About the middle of it is developed the proper northern Renaissance, the high Renaissance. At about the end of the century again occurred a change in style. At the courts and the buildings under their influences the Italian tendencies in their more severe and scholastic conception acquired new power and finally

the control. The late Renaissance commenced. But in the art of the people, particularly in the more distant provinces, the mediaeval motives were retained until in the first quarter of the 17 th century, in which they completely disappeared under the gradually established dry elements of the beginning Barocco style.

II. Evolution in the Different Countries and the Monuments.

1. The Netherlands.

To the Netherlands belonged in the 16 th century, besides the existing kingdoms of that name and of Belgium, also Luxemburg and some adjacent provinces of France, being altogether 17 provinces, each one of which had a certain independence in its government. In the northern provinces predominated the German language and culture; in the southern the Romanesque-France (Walloon) had the preponderance. Under Charles V (page 242), who was himself born and brought up in the country, it reached extraordinary prosperity by the flourishing commerce and industries. But under his son Philip II began about 1568 the insurrection of the Netherlands against religious and political despotism, and then originated those long and bloody wars for freedom from Spanish rule, as a result of which the northern Netherlands (Holland) freed itself from Spain, while the southern provinces remained under Spanish rule. These were held by Catholicism; but Holland became Protestant. The national and religious opposition between the southern and northern Netherlands likewise impressed itself on the architecture.

About the end of the 15 th century (about after 1480) the first isolated Renaissance motives under Burgundian influences penetrated into the flourishing late Gothic of the Netherlands; but only with the beginning of the 16 th century did they acquire a greater extent. Belgium preceded in time. Already before the end of the second decade buildings arose there, on which the architecture exhibits the predominating character of the Renaissance. In the thirties appeared an earnest endeavor for a more severe architectural subdivision, even if also on the whole only a certain sham organism was at-

attained, which was broken by details of independent creation. The ornament (acanthus arabesques) at about this time was already surprisingly pure. About 1540 began a zealous study of the Italian theorists, from then onwards expressed in the ecclesiastical and secular architecture, in the former particularly by the architectural activity of the Jesuits, an ever deepening influence of Italian art, which also continued when the Belgian architecture -- about 1610 -- passed into the Barocco.

The first architectural monument of the Belgian Renaissance was designed by a Burgundian master, Guyot de Beauregard, whom Margaret of Austria, Stadtholder of the Netherlands, took into her service for the building of her palace at Mechlin. (1517). The execution was supervised by Rombout Keldermans of Mechlin, the first important Netherlandish architect of the Renaissance, but who still stood entirely on the stage of the transition from late Gothic to the Renaissance. The palace is a simple structure with somewhat timid and predominating French forms. Its principal effect lies in the two great gables of the front and side facades. The house zum Grossen Salm (great salmon) in Mechlin (1519) by Jan Borremans from Brussels already shows on its very narrow facade three orders gracefully executed with rich ornamental decoration. The beautiful old chancery building at Bruges (1535-1537) was designed by Jonann Wallot and built by Christian Sixdeniers (Fig. 325), has two orders with stronger lines in general. But the cornices are still very restrained and profiled without intelligence. On the gables the Gothic reacts in the curves and the crockets. But the ornament scattered over the facade (acanthus arabesques) is already entirely pure. The Belgian Renaissance exhibits its full maturity in the stately city hall at Antwerp (1531-1535) by Cornelius de Vriendt or Floris, a pupil of Giovanni da Bologna, and Paul Snyderinx. On it the Italian symmetry is combined with the northern art in design in a very happy manner. (Fig. 326). The palace-like facade extending in width and broken by a richly subdivided middle projection has above a portico-like rusticated lower story two small pilaster orders resting on the pedestals of the window parapets and a crowning half story, treated as an open

gallery. The strongly aspiring middle building passes into a tower-like termination. The general impression is entirely Netherlandish. More details in the restrained academic tendency may be seen on the justice building at Furnes (after 1612) and falling in the 17 th century. Its two story facade has in the ground story the Doric and in the upper story the Composite pilaster order in noble, though also freely handled treatment. This building is the last important work of the Belgian Renaissance. The palace at Brussels (completed 1564) built for the cardinal and statesman Granvella still in the 16 th century by Sebastian van Noyen (died 1557) and his son *22* Jacob van Noyen (died 1600) exhibits a direct transfer of the Italian late Renaissance to Belgian soil by the architects. The elder van Noyen had made studies in Italy and had published (1562) a great work with drawings of the buildings of antique Rome. The art tendency introduced by them found no other followers.

** Coraelius Floris is designated as the inventor of the cartouche; but the cartouche appears to be actually of older date. On the other hand, he is the creator of a distinct ornamental style, named after him the Floris style, that is characterized by simple cartouches in combination with hermes, festoons, bands and similar motives.*

In Holland the old traditions were longer and more strictly preserved. True Renaissance buildings first originated there about the middle of the 16 th century. On them from the beginning appeared an energetic striving for national independence. Holland art is an expressed assertion of the citizens' spirit prevailing there. Therefore it is less ideal than realistic and pursues definite external aims. If these are attained, then a harmony in the work is cared for in regard to the formal treatment. And therefore its works have an innate truth, a striking expression of their purpose, such as not always attained in other creations, in which the endeavor for monumentality predominates.

In general architectural activity in the second half of the 16 th century was greater in the Holland provinces, than in the Belgian. The Holland house as the Belgian showed a stron-

strongly emphasized vertical tendency, indeed in a reaction of the Gothic, which had become deeply rooted in the people and had produced in the city halls works, that were no longer surpassed in the later periods. The columnar and pilaster orders were mostly set with very small intervals. They were far less employed in Holland than in Belgium, and indeed almost entirely for public buildings, partly for entire facades, partly for the upper story alone, in the latter case being sometimes set on projecting consoles. But they never succeeded in a satisfactory combination with the national forms. Characteristic of the Holland Renaissance is the combination of bricks with cut stone, and the strong color effect produced by the alternation of the materials. Projecting blind arches consisting of brick and cut stone voussoirs, over rectangular windows, horizontal continuous belts and ashlar with bosses set at the angles and vertical edges, wrought iron anchors as ornaments, and in the general appearance a picturesque and unsymmetrical grouping with a harmonious equilibrium of the architectural masses, animated outlines by means of the high stepped gable and fanciful forms of towers (consisting of superposed diminished low stories with galleries, open aisles and oggee domes are the chief characteristics of the style.

Of the more important architectural works, the city hall in the Hague (after 1564) yet recalls the Italian Renaissance in its subdivision. The developed Holland style is exhibited by the city hall at Franeker (1591). But it is most strongly expressed on the abattoir at Harlem (1602-1603; Figs. 327, 328) by Lieven de Key (died 1627), which like the former, entirely rejects pilasters, columns and cornices in the sense of the classical treatment. On the city hall at Leyden erected at the same time (1597-1604), which is likewise ascribed to Lieven de Key, the imposing middle building with the flight of steps in front, pilasters, columns, hermes and cornices has a form treatment allied to the Renaissance. But the general appearance is entirely Dutch. In the further development the influences of classical art make themselves apparent in increasing measure. The pretty city hall at Bolsward, built in

1614-1618, shows in the upper story projecting columns on consoles and carefully designed cornices. (Fig. 329). The shafts of the columns are crossed by intermediate belts, so that the face of the wall seems held together. The leading masters of the late Holland Renaissance is Hendrick de Keyzer (1567-1621). Among his works the Protestant churches merit consideration, which he erected in the recently established parts of the rapidly growing capital, Amsterdam. The Zuider church was built 1603-1611 and has the ground form of a three aisled rectangular hall building with pulpit at the middle column. The elevated middle aisle is covered by a tunnel vault with transverse arches, and the side aisles by cross vaults. At one angle is built a square tower (Fig. 330). The Wester church (1620-1638) has the same transverse design; but the tower projects on the longitudinal axis. The structure follows the basilican scheme (with clearstory). Here the two extreme intersection are extended as transepts to the height of the middle aisle, while the Zuider church merely has two transepts indicated by the height of the side aisles. The two external longer sides were very effectively treated thereby. The architect wished also by this to emphasize the transverse axis on the exterior, also accented in the interior. The Noorder church (1620-1623) has the ground form of a Greek cross with low triangular additions. (Fig. 331). The four free piers support a central cross vault; the cross arms have tunnel vaults. The pulpit stands at one pier of the crossing. The seats are arranged concentric with it, so that the diagonal becomes the main axis. Thereby Keyzer neutralized in a bold way the disadvantages of the cross plan of a church for preaching. All these churches lack galleries. Their architecture like that of the secular buildings of the master (East India Court in Amsterdam and Mint at Enkhuyzen) a dry and severe character, developed merely with intelligence. But yet his school found in Holland animated approval and wide extension, entirely dominating the architecture of the later Dutch Renaissance. About the middle of the 17th century was introduced a new period of development.

More than for its artistic and esthetic side the Netherland-

Netherlandish architecture of the Renaissance must be esteemed for its great historical importance. As we shall see later, it exerted a determining and permanent influence, not only on the architecture of the adjacent countries, but also on that of the German coast provinces as far as to the Slavic East.

2. Germany, Austria and Switzerland.

A. Historical Basis, Evolution and Style.

In the period of the Renaissance (after the imperial diet at Cologne in 1512), Germany consisted of ten circles, including Austria with the exception of the Bohemian provinces, H Hungary and the southern Netherlands, thus of small territories, internally capriciously governed and externally weak, under the supremacy of the emperor. Under Charles V, the heir of the German-Hapsburg and Spanish-Italian countries, Germany formed a portion of the Hapsburg world empire, and as such was developed in its interests. Charles' reign (1519-1556) was not fortunate for Germany. He chiefly resided in Spain (page 241), leaving Germany to the imperial government and to his brother Ferdinand, reigning after 1526 as king of Bohemia and Hungary, (the later Roman-German emperor). While he waged long wars with France for the possession of Italy, there occurred in Germany violent religious wars by the reformation, and in connection with these the bloody peasants' war broke out. The former resulted in the division of the empire, which restricted a peaceful internal development. First after the religious peace of Augsburg (1555) began an improvement, and under Ferdinand I (1556-1564) and Maximilian II (1564-1576) the German countries enjoyed a period of continued peace and of high material prosperity, which certainly was lessened by political divisions and bitter religious strife, not only between Catholics and Protestants, but also among the Protestants themselves. Under Rudolph II (1576-1612) set in the counterreformation, aiming on the one hand at an internal strengthening of Catholicism, and on the other to fighting Protestantism and recovering the provinces conquered by it, and whose supporters were principally the Order of the Society of Jesus. From the opposition of the Protestants to the

suppression of their confession by the Bohemian king Ferdinand (later emperor Ferdinand II), favorably inclined toward the counterreformation, originated the thirty years' war (1618-1648), fatal to Germany in the highest degree, by the destructive conduct of which, the German countries were completely devastated and exhausted, the population reduced to a fourth, and the ordinary and intellectual civilization was destroyed. On the development of art was exerted a determining influence by these political conditions, deeply injuring the life of the people and the mind.

In the eighth decade of the 15 th century the influence of the Italian Renaissance in Germany becomes perceptible and is indeed as elsewhere in the works of the minor arts, in wood engravings, on the backgrounds of paintings, on altars and tombs. Soon afterwards German mechanics, who had gone to Italy in their wanderings, and Italian architects and stonecutters, who sought employment on this side of the Alps, transferred the forms acquired in the south to the northern buildings. In the first quarter of the 16 th century already originated certain works, in which the Renaissance motives maintained their predominance over late Gothic forms. After 1580 the Renaissance increased its extent north of the Alps, beyond the Thuringian forest and the Erz mountains. It exhibits from the beginning onward a mixed variation and a certain inclination to Barocco forms. The Gothic reminiscences continued until in the beginning of the 17 th century. *

** On the Peller house at Nuremberg (1605), whose facade entirely belongs to the late Renaissance and already shows Barocco tendencies, the entrance and the rooms in the ground story are still furnished with splendid late Gothic vaults, and the parapets of the court facades have tracery.*

In the general view of German Renaissance architecture appears an expressed contrast between the southern and middle, and the northern German provinces. On the one hand it is based on the diversity of the character of the people, on the other on the inequality of the acceptance and influence of Italian art. In the south, where men were particularly receptive of new ideas by the commercial relations with Venice,

Burgundy and Spain by the great mercantile associations, the new form world found entrance directly from Italy, and even if it lost much of its purity, yet it substantially formed the determinant of the artistic expression. The portal represented in Fig. 332 seems like a direct transplanting of forms from upper Italy to Austrian soil. But the north received its impulses only exceptionally from Italian masters. Almost entirely they came in an already weakened form and with a stamp already in the sense of the northern conception, and indeed only for the smaller part from middle and southern Germany, but instead in a broad stream from the Netherlands. In both cases it was met as something complete, that required no further transformation. Therefore to the north was lacking the period of growth, the early Renaissance, which in southern and middle Germany took a development similar to that in France and the Netherlands. The early Renaissance of the north must be sought in the Netherlands.

There were some important native masters, among whom first of all were the painter Hans Burgkmair in Augsburg, the two Holbeins in Augsburg and Basle, and the bronze sculptor Peter Vischer in Nuremberg, who appeared as the path-breakers of the Renaissance and therefore exerted a deep influence. Their endeavors were aided partly by the imperial court, partly by princes of certain smaller states, which in their independence sought to equal and indeed to surpass the splendor of the imperial court. Thus developed certain centres for Renaissance art, of which the courts of the humane emperor Maximilian, well inclined toward the arts and sciences, and the Palatine and Bavarian princely house of Wittelsbacher are to be mentioned in the first rank. But in general the princes had too much to do with the religious and political tumults of the time, to be able to adopt and realize grand architectural ideas. The mightiest impulse to activity in art lay in the citizen class. There indeed reacted the conservative sense more strongly, as it had developed in the city commonwealth and in the guilds. However the citizen class already from the beginning took part in the movement. The Fugger family in Augsburg, for example, was scarcely inferior to the cl-

class of territorial princes in the encouragement of art.

Until the middle of the 16th century the Renaissance in southern and middle Germany permits the recognition of a progressive adoption of the new form elements, whereby a peculiar change to a purer development became apparent to but a limited extent. About 1550 it passed into the stage of its maturity. Already a decade later on certain buildings becomes perceptible the beginning of a further development; about from 1580 onward this appears generally. It is expressed in an energetic striving for severer proportions in the composition and the facades, and for a purer treatment of the members. The influence of the Italian Renaissance comes into force in increased measure. Some important northern masters, to whom the Renaissance forms offered nothing new, and who were capable of deeper conceptions, went to Italy; there the works of the great Palladio made a deep impression on them. Thereby the classicistic endeavors in the sense of the Palladian school also became effective in German architecture. Since the Italian art about this time passed into Barocco, it was unavoidable, that also the German now received a strong Barocco impulse. The heightening of the effect, for which men strove in Italy with full clearness of aim by elevation of the monumental expression, was sought in Germany in attainment by other means, particularly by the enrichment and overloading the decoration (Fig. 333), the accenting of details, the heaping up of sculptured and ornamental decorations, the frequent use of the cartouche and the transformation of the ornamental motives into the gristle style. Indeed a laboring for grand monumental effect in Germany cannot be denied; on not a few works was this also attained. But the general character of the period is not determined by them. The lofty flight in architectural ideas and the harmonious perfection with a conscious aim in the sense of the Barocco idea was not allotted to this epoch of German art. It rather maintained on this stage its entire nature according to the character of the Renaissance.

Thus we have to distinguish three epochs in the architecture of southern and middle Germany, the early Renaissance of

about 1500-1550, the high Renaissance of 1550-1580, and the late Renaissance from 1580 to the end of the 30 years' war. (1648).

In north Germany the first influences of the Renaissance make themselves apparent about the middle of the 16th century. They come from the Saxon provinces and show themselves almost entirely on the shells with spheres added over the steps of the gables, in the division of gables by pilasters, and on the tasteless projecting cornices. After 1550 began the victorious march of Netherlandish art over all Germany from the Weser to the Danube. By the active commerce between the Hansa cities and the Netherlands, that also related to artistic products, the soil was already prepared. It is also proved that Netherlandish artists extended their activity far to the east. In certain coast cities, particularly in Danzig, Netherlandish art found direct and unchanged acceptance. During the entire second half of the 16th century the north then developed an extremely strong activity, which continued even into the 17th until late in the 30 years' war. It flourished in the external and also especially in the internal architecture in much greater richness than in south Germany, but was already from the beginning strongly inclined to Barocco forms, which with the beginning of the 17th century took the upper hand, so that they gave to the succeeding northern architecture an almost Barocco character; certainly this was not, or only exceptionally expressed in grand Barocco compositions, but rather in the style and richness of the decoration.

Thus the Renaissance in north Germany had only two periods of development to be mentioned, the high Renaissance of about 1550-1600 and the late Renaissance of 1600 to about 1650.

In the style of the German Renaissance the characteristics mentioned on page 269 become most prominent; in the early period the restrained and purely external employment of the antique subdivisions (Fig. 308), and also in the developed Renaissance the long continued (until in the 17th century) mixture of styles (Figs. 334, 335), and further the permanent difference between the Italian and the northern art conceptions, the lack of grand treatment of interiors, the picturesque

grouping of the architectural masses, the accenting of definite parts of the building, the steep roofs with the high stepped gables, or those bordered by capricious curved forms (Figs. 335, 356), the free treatment of columns, pilasters and cornices, the preference for candelabra supports and hermes, the rich ornamental, indeed both sculptured as well as painted decoration. Likewise the internal decoration and the ornament have already been fully described. For the works concerned, stone construction was intended, so far as relating to the facade architecture. But in German wooden construction also found zealous employment. In it the old traditions continued more strongly. Yet also this derived abundant gain from the treasure of forms of the Renaissance. Two systems of construction in it may be distinguished, the log and the half timber construction.

Log construction is the method of building in mountain regions, particularly in the Alps, their offshoots and in the Bohemian forests. In it the walls are built of trunks of trees or hewn timbers laid on each other. (Fig. 336). The connection with the adjacent walls results by dovetails and projections, so that a very strong connection is produced. The most extensive use was found by log construction, as well as wooden construction generally, on the houses. The ground story of the Alpine houses is chiefly of stone, the upper being of wood with widely projecting galleries. In the front are the living rooms, in the rear being placed the stable and the sheds. The whole is covered by a low and strongly projecting roof, covered by wooden shingles and often loaded with blocks of stone. Also over the doors and windows small caps were frequently placed as a protection from injury by the weather. Ornament is but sparsely employed on the portals, window enclosures, galleries and the carvings on the external planks. The Black Forest house does not essentially differ from the Alpine house in plan and treatment. It has on a low stone ground story a living story sheathed with boards, over this being a widely projecting and partly hipped roof covered with straw. (Fig. 337). The attic is used as a shed. To permit driving into the attic, the house has its rear against a hill

or an inclined driveway. Decorative ornament is but very sparingly applied. These dwellings in the Alps and the Black Forest have a very picturesque effect by the deep shadows cast by the projections of the roof, the galleries and caps, by the warm tone of the wood above the dazzling white plastered substructure in the fresh green of the mountain landscape, with which by the suitability of the construction, it appears to have grown up. (Fig. 337). *

** We have mentioned the architectural style of the mountain regions with the half timber construction of the Renaissance, since its construction and mode of decoration are substantially determined by those of the Renaissance. The existing buildings also seldom date from an earlier time.*

Half timber work constructs the walls with posts, that stand on sills and are tenoned into plates above. The posts are stiffened by horizontal girts or by inclined timbers (braces or ties), the remaining panels being filled with brickwork or also with straw mixed with clay and wrapped around sticks. On the plates rest the beams, whose ornamented ends generally project beyond the lower face and bear the sill of the upper story. Hence originated the corbelling of the stories, which afforded statical advantages, while it prevented the bending outward of the front walls; it likewise permitted increased use of the interior and gave to the facades a suitable division between stories casting deep shadows, at the places accented by bold cornices in stone construction, recalling architectural motives by the corbel cornice. On the beam ends and plates, portals, the corner and even the middle posts, on the window parapets and enclosures found extensive employment, partly the antique treasure of motives in very tastefully changed wooden forms suited to the material, partly the ornamental riches of the time. (Fig. 338). The gable in imitation of stone construction often projected above the roof in curved forms. The north German wooden construction is quite regularly executed. The posts are mostly uniformly spaced and are set vertically over each other. The timbers and panels have a rich decorative ornamentation. (Fig. 338). It is less severe in south Germany. The posts are very freely spaced a

and the beam ends are often concealed by wooden cornices. The wooden have less projection. The entire decoration is limited to the curving and crossing of ties, which are frequently arranged in the form of flat patterns. As a rule only the corner posts and the enclosures of doors and windows are ornamented. At some time these half timber structures, that reached a high development in Swabia, in their simplicity often have an effect, grand in a certain sense and frequently even monumental. *

** Half timber construction was already treated artistically in the middle ages and even in the Germanic early period. In Germany it attained in the time of the Renaissance its richest development. The Barocco, which worked so much with imitative materials, allowed it to disappear under the coating of plastering.*

In regard to the architectural works, what we have said on pages 217 to 282 on the chateaus and other secular architecture, as well as on the Catholic and Protestant church architecture, applies to German architecture in its entire extent. Likewise in the German Renaissance, chateau architecture stands in the foreground. But since in chateau as well as in church architecture native masters alternated with Italian, and the latter not infrequently predominate, the specific German and the peculiarities of a definite architectural domain less plainly appear. The city and private buildings express far more than the chateaus the character of the country. *

B. The Most Important Monuments.

** The consideration of the monuments of the German Renaissance we cannot carry out in the previously employed sequence of the periods of development, because the Renaissance occurs irregularly in the German countries, proceeds from different points, and the unified development of the style also lacks like architectural periods and regions. By an arrangement according to the species of the buildings, so that we may successively describe the chateaus, churches, public buildings, private structures etc., the general view of the architectural activity in the different countries according to their kinds and importance, which we have to emphasize, would be ent-*

entirely lost. Therefore we shall consider the monuments according to the separate architectural regions, thereby retaining in general the sequence, which is given by the general course of development of the Renaissance in Germany and by the predominance of the principal tendencies.

In the adoption of Renaissance forms south Germany precedes. The rich commercial city of Augsburg stands in the first place. By its animated traffic with Venice, the earliest influences came from Venetian art. Some important masters had prepared the soil. There worked Hans Burgkmair, very gifted in forms (1473-1531), who exhibited in his paintings the realism in the free conception of nature characteristic of the period of the Renaissance, was indeed doubtless in Italy before 1500, and introduced the new forms in his paintings and drawings for woodcuts. He can pass for the first German master, who aided the transition to the new style. Beside him worked in the same sense the intellectually allied elder Holbein (about 1460-1524). About 1511 originated the first architectural work of the Renaissance in Germany, the Fugger chapel near S. Anna in Augsburg. It is kept in pure Venetian early Renaissance, aside from the net vaults covering it, and it is assumed to have been erected by a master Hieronymus, trained in Italy and practically employed in Venice. Thenceforth Augsburg was the earliest centre and starting point of the Renaissance in Germany. Its extension first occurred chiefly in works of the minor arts, indeed principally on altars and tombs.

From Augsburg Hans Holbein the Younger (1497-1543), the son of the one just mentioned, went to Basle already in the 18th year of his life, three years later to Lucerne, and probably from there to Upper Italy. At least it is to be assumed with some certainty, that he visited Como and Milan. After his return, he was a zealous representative of the Renaissance, whose spirit he fully understood. But he treated it with entire freedom and gave it an entirely German character in regard to ornamentation. Likewise in this as in his numerous designs for façades, decorations and the art industries, the great painter showed himself a talented master in treatment of form,

to which German art can scarcely show a second. The Renaissance also took its further way from Basle, yet for the next time by the mediation of the minor arts.

First in the thirties originated the earliest larger architectural works of importance. In that time the Bavarian dukes commenced their extensive architectural activity. From 1536-1543 the royal palace at Landshut was erected by German and Italian masters. The wing toward the Altstadt was by the German masters Nicolaus Ueberreiter and Bernhard Zwitzel, and it was kept in the early German Renaissance. Likewise the portico-like vestibule with the marble columns belongs to this style. The three other wings enclose an arcaded court with Doric columns and were built under the lead of a master A. Antonelli from Mantua, a representative of the school of Sanmicheli. Not merely the court but also the rooms are very impressive, and would merit consideration, even in Verona. The mediaeval castle of Trausnitz near Landsberg received about 1550 the so-called Italian building with simply treated pier arcades of wide span in the two upper stories of the court side. The magnificent interior decoration of the principal story consists of paintings of grotesques (Fig. 339), panelings and forms of ceilings in an expressed Italian character. But their execution followed later, mostly between 1576 and 1580.

Comparatively early Nuremberg took part in the new movement. There the house architecture of the citizen class reached greater and truly popular development. The plan of the house follows the type generally common in south Germany (page 279); they have small width of facade, but imposing height and are very deep. Splendidly ornamented bay windows and stately gables form the chief parts of the very simply treated facades. The courts are enclosed by arcades, on which Renaissance and mediaeval motives are combined in a charming and harmonious manner. On the Cloth Hall mediaeval and Renaissance motives are balanced; the windows recall the French early Renaissance.

3. The Hirschvogel house of the same time is famous for its magnificent garden hall, designed in 1534 by Peter Flötner already in mature and noble Renaissance forms. The exterior has

a very pleasing **subdivision** into stories and a bold crowning cornice; the design appears to have been preceded by studies in upper Italy. On the much later four story Töpler house (1590-1597), the keynote is still given by the mediaeval forms on bay windows, on the window forms and the gable. (Fig. 340). The Renaissance obtained a complete victory on the very famous facade of the Feller house (1605), but both in the details as well as in the general effect, Barocco ideas already notably appear. (Fig. 341; also page 290). On the city hall, begun 11 years later, all **reminiscences** of the middle ages have disappeared. The elongated facade (Fig. 342) rejected columns and pilasters, but obtained a great effect of the powerful treatment of the portals and the window enclosures. The arcades in the two upper stories of the court have a subdivision by pilasters. The master, Jacob Wolff the Younger, had made studies in Italy, probably in Genoa.

A similar and purely citizens' art tendency, even if in smaller proportions, is found in the neighboring Rothenburg-o-T. There the marketplace with the stately city hall affords an entirely charming view of an old German city. The city hall was built in 1572 by a Nuremberg master, the elder Jacob Wolff, father of the one previously mentioned. The long facade is broken by an octagonal stairway tower and before it is placed a rusticated arcade portico with a balcony. The isolated angle is accented by a high tower-like bay window. The architecture of the portico and of the portal in the gable end exhibits a certainty in handling Renaissance forms, scarcely found at that time in German masters.

In Munich about the end of the 16th century, Friedrich Sustris and Peter Canoid were engaged, who had been trained in Vasari's school and represented the Italian Renaissance in the Netherlandish conception. They proved themselves important artists, who dominated the forms with sovereign mastery, and powerfully influenced their contemporaries. Their first important work is the church of S. Michael (1583-1597), a plan with a single aisle (Fig. 343) with transverse aisle and a long choir ending in polygonal shape, with three relatively small side chapels terminating in semicircular form, above t

2. them being galleries, without a dome, but with a very happy introduction of the light. The walls have double pilasters and a high attic; the tunnel vault is treated as a coffered stucco ceiling. The whole is nobly handled in the proportions and moderately decorated, and in its general effect is a grand internal creation. The design was by Sustris, although this cannot be proved without objections. Peter Candid passes for the architect of the impressive wings enclosing the Kaiser court of the royal palace, erected in 1611-1619 for Maximilian I. The exterior is plainly treated; the beautiful and rich portals of the year 1614 (Fig. 344) on the otherwise undivided western facade permit the recognition of a strong influence of the Italian Renaissance. In the interior the stairway design and the rooms of the principal story, by the grand and harmonious proportions and the noble treatment of the details, have a distinguished effect and a select and a truly princely magnificence. The Renaissance perhaps has in Germany no second work of equally perfect treatment to be mentioned.

Meantime Augsburg had entered into the times of the high and late periods. In the year 1570 Jacob Fugger had called the Venetian Antonio Ponzano with other Italians to Augsburg and had a series of rooms in his palace decorated entirely in Italian style. * But the greatest work of Augsburg architecture was completed in the late period by a native master Elias Holl (1573-1646), the important city architect. Already in the 17th year of his life, he came to Italy in his wander years, and a few years later he built in his native city the arsenal, that with its three story, richly treated facade 3. crowned by a gable, already exhibits a complete mastery and shows an entirely free creation with a visible influence of Palladian art. His chief work, the city hall (1614-1620) has a severely symmetrical plan. In the ground story a central three aisled hall extending the entire length of the building has about a third part of its width. From it on the transverse axis to the right and left, stairways lead in two branches to the upper story, and indeed to the "Golden Hall" extending through three stories and located over the lower hall. In

the angles lie the "princes' chambers". The treatment is extremely magnificent and stately. Holl gave to his native city a grand appearance. Even his city gates exhibit a noble treatment, splendidly appropriate to their purpose.

** The same master was also later (about 1588) employed on the antiquarium at Munich and the grotto portico of the royal palace.*

In Swabia is to be mentioned a very early monument of the transition from Gothic to Renaissance, the octagonal spire of S. Kilrain at Heilbronn, erected in 1513-1529 by Hans Schweiner of Weinsburg. (Fig. 345). From 1579 to 1582 the old Gothic city hall there was rebuilt. Its longer side is turned toward the marketplace, and has a high flight of steps treated as an arched portico, and a grouped dormer gable above the main cornice at the middle. (Fig. 323). To the early Renaissance also belong further extensive new buildings added after 1537 to the castle at Tübingen, whose principal wing contains a great hall extended by a large balcony structure. The pompous and already strongly Barocco front portal building dates from the beginning of the 15th century. In Stuttgart the old chateau was erected after 1553, leaving an older wing of the building. As architect is mentioned Aberlin Tretsch. On the exterior by the earnest and undivided architectural masses and the strong round towers it still bears the character of a castle. The court of the chateau is surrounded by three story **arched** porticos, whose segmental arches are supported by very freely treated columns. (Fig. 321). Particular interest for the history of architecture is presented by the plan of the chapel as a narrow rectangular hall, which is extended on one of the two longer sides by a polygonal bay niche. (Page 281 and Fig. 324). This chapel is the earliest church building on German soil, whose plan is exclusively designed for the requirements of Protestant divine service. *A masterpiece of a rare kind, that strikingly indicates the increasing enjoyment of a more cheerful course of life in the age of the Renaissance, was the summer house (lusthaus) erected for duke Louis in 1575-1590 by his architect George Beer near the chateau, and which unfortunately was torn down in 1846. It had

a rectangular plan, an open arcade portico extending around it externally, interrupted at the angles by small and elegant round towers, and at the middle of the main facade by a high flight of steps, above which was a portico-like projection crowned by a gable (Fig. 346), and stately gables on the side facades. The ground story contained a great promenade hall leading around great water basins, above it being a similar festal hall. For the works on the summer house under Beer, Heinrich Schickhardt (1558-1634) had also participated, who afterwards exerted a great activity in Wurtemberg as ducal court architect. He in Italy had measured and drawn buildings by Palladio and Genoese palaces. It was allotted to him to not only build anew chateaus, churches, schools and the like, but also entire cities. (To him are attributed 12 chateaus, 17 churches and a great number of public and private buildings). He designed the plan of Freudenstadt in Swabia for the Protestants expelled from Austria, and erected there the church (1601-1608) according to a very original ground plan, when he arranged two wings of the building adjoining at a right angle, one of which was assigned to the men and the other to the women. His chief work was the magnificent Neue Bau (new building) in Stuttgart, later destroyed by fire.

** The chapel of the chateau of Torgau dedicated by Luther in 1544 is indeed of earlier date, but in its ground plan as a rectangular hall with galleries placed around it and between the buttresses of the vaulting, was based on the external conditions of the building of the chateau.*

Of the half timber construction, which rose to high perfection in Swabia, nearly every city possesses splendid examples.

Among the monuments on the upper Rhine is the chancery building at Constance (1592), worthy of consideration for its picturesque court furnished with arched porticos of wide span between round towers. In Basle the pleasing facade of the goldsmiths' guild hall (Geltenzunft) (1578) arranged in three orders suggests the study of the writings of Serlio. (Fig. 347). On the somewhat later Spieshof (1600) is employed the triple window motive of Palladio. Italian influences also appear on the city hall at Mülhausen-i-E, well known for its

fresco paintings in which the painter (Christian Vacksterffen from Colmar) in the year 1552 imitated rusticated ashlar work in the lower story and an architecture of columns and niches in the upper one. In Strasburg Daniel Specklin (1536-1589), a much traveled fortification architect, designed about 1585 the facade of the old city hall as an entirely regular plan with pilaster subdivision in the stories graduated in height. The portal and pilaster architecture approximates the Italian form treatment; the general appearance, particularly the treatment of the windows and the roof, bears the architectural character of southwest Germany. The Frauen (women's) house erected on the Münster place in 1581 belongs to the most notable half timber works in southern Germany. The internal treatment of certain rooms (Fig. 348) allows the recognition of the predominance of an architectural spirit with the aim of a grand and comprehensive use of the architectural members in favor of a unified effect. The chateau at Baden, begun in 1569 by Caspar Weinhart, is noteworthy, in that in the arrangement of the ground plan care is already thoroughly taken for convenience, when the rooms are connected with a corridor extending through the middle of the building. On the somewhat later chateau Gottesau near Karlsruhe (1588-1594) with round towers covered by domes, built by a Strasburg master, Paul Maurer, French influences made themselves felt by the mediation of the margrave Ernst Friedrich. (Fig. 349). In Heidelberg the house zum Ritter (of the knight), built in 1592 by Charles Belier, merits consideration on account of its rich facade, characterized by colonnades and two bay windows. The principal work of south German, and of the German Renaissance in general, is the grand chateau romantically enthroned above the city. It consists of several buildings grouped around an irregular court approximating a square in its general form, and that date from different times. The towers on the hillside, certain lines of walls and parts of the structures still belong to the 15th century. The earliest building dating from the Renaissance period is the "Glass Hall Building", erected about 1550 by Jacob Heider. Of the former facade only about a half with the loggias extending through three stories

now remains; but even this small portion is an extremely picturesque part of the interesting court of the chateau. In the years 1556-1563 was erected the Otto-Heinrich building, adjoining at a right angle. The famous facade is built in three stories above a high base. It has a well considered subdivision by Ionic rusticated pilasters in the lower story (above which is a Doric triglyph frieze), Corinthian pilasters in the second and Corinthian columns in the third story. (Fig. 350). The influence of the Italian Renaissance cannot be denied, and particularly of the writings of Serlio. Yet the composition is entirely independent and entirely of German character. The master is not to be named with certainty. It is assumed that the design was by an otherwise unknown artist, the Netherlandish sculptor Anthony. Another Netherlandish master, Alexander Colins, took part in the execution, who is to be regarded as a successor of Anthony. From 1601-1607 beside the hall building was erected the imposing and very monumental Friedrich building by the Strasburg master Hans Schoch. For the facades (Fig. 351) the master adopted the system of the Otto Heinrich building, yet developed them with a freer and substantially maturer treatment of form. With the energetic accenting of the structural framework, luxuriant rolled work and cartouche ornament, as well as the rich figure decoration designed by Sebastian Götz from Chur, is combined into a harmonious whole of rare worth. We have in the two facades of the Friedrich building an extremely interesting and powerful expression of the German art spirit.

In German Switzerland the close relations with Italy were also effective in architecture. But the German conception gives the keynote in the plan and the treatment of the facade as well as in the stone construction. In Lucerne Giovanni L. Linzo erected after 1507 the Ritter's palace (now government building) with beautiful portico court. The city hall there was begun in 1601 and adheres more closely to northern art. Zurich has some interesting guild houses. Likewise in artistic dwellings meriting consideration, Switzerland has a large number to exhibit. Yet it lacks the larger chateaus. The Stockalper palace in Brieg (upper Wallis) of 1611-1617 consists of two tall and massive structures connected by a loggia

and an arcaded court protected by three defiant square towers, but it can more properly pass as a private house arranged in the grand style.

202 In Austria the prevailing northern art character, by the vicinity of Italy and by the mixture of races already **inclined** in conception to the southern art feeling in plan and form treatment, experienced a refining, which is particularly to be recognized in the endeavor for clarity and simplicity with dignified and carefully weighed treatment of details. In the southwest provinces and especially in the Tyrol is commonly found the motive of open arcades ("pergolas") derived from the antique, which surround the marketplaces and are frequently continued along both sides of the adjoining streets. In the late Renaissance there, as well as in southern Bavaria, occurs the horizontal termination of the facades instead of the high gable. On the other hand the preference for the bay window, mostly beginning at the ground and extending through all the upper stories, preserves the German character. Among the Tyrolese nobles' seats the restorations and new structures at chateau Ambras (after 1563) take a prominent place, and were erected by the archduke Ferdinand for his wife, Philippine Welser. The facades are adorned by architectural and figure representations, partly in sgraffito and partly painted in fresco. Besides other splendidly treated rooms, the interior contains the great Spanish hall 141.1 x 32.8 ft. (Fig. 352) with very tasteful architectural enclosures around the windows and the portraits of Tyrolese princes and a rich wooden ceiling. The externally tasteless chateau of Velthurns near Brixen (1577-1586) contains in its prince's apartments internal decorations, particularly door enclosures, wall panelings and wooden ceilings, that belong to the best works of the Renaissance. In Salzburg the bishop's palace was begun in 1592 and was built in an expressed Italian style, and likewise the cathedral (1614-1634), in which Santino Solari from Como, a pupil of Scamozzi, employed the ground form of S. Peter's in a free manner. The capital of the Steiermark, Graz, has in the Country house (Landhaus) a noble building of the year 1560 (Fig. 353) kept in the severe forms of the Italian

high Renaissance. In the archduchy of Austria between 1530 and 1600 extensive new buildings were erected on the Schallaburg near Mülk with a beautiful arcade court, where each two upper openings correspond to one opening in the lower story. The columns are of marble, and the rich relief accessories of the upper gallery are mostly of terra cotta. There are indeed expressed here influences of the upper Italian style of architecture, as on the arcade court of the chateau of Rosenberg near Eggendorf (after 1593), in which the splendid statues are likewise made of terra cotta. At the court of Ferdinand at Prague already from the thirties of the 16th century, an Italian artist colony was in the service of the monarch. The summer house or Belvedere on the Hradschin was built by Paolo della Stella, and it is a rectangular structure surrounded by an airy arched portico on slender Ionic columns, that recalls the basilica at Vicenza. Scamozzi was also employed in Prague. The stairway of the Hofburg is attributed to him. The noble garden portico of palace Wallenstein (1629), opening by three arches on doubled columns, admits the suggestion of Genoese models. As architect Giovanni Marini is generally named. I might concur in the assumption of Gurlitt, who declares it to be a work of Bartolommeo Bianco (page 234). The mausoleum of archduke Ferdinand II, erected 1614-1622, is a genuine product of the early Italian Barocco style. Into Hungary the Renaissance quite early found entrance under the favor of king Matthias Corvinus (1458-1490), who is to be counted among the greatest admirers of the Italian Renaissance. (To the influence of Hungary seems to be due the early penetration of Renaissance forms into Silesia). Besides the Siebenburg chateau of Kronstadt and some noteworthy chateaus of the nobles, the Renaissance produced important citizens' houses with court arcades in several cities, particularly in Keskmark, Deutschau and S. Georgenburg.

In middle Germany, Saxony and Silesia take precedence. There comparatively early a true architectural school was developed, which received its impulses manifestly from the Lombard Renaissance, especially from that tendency which proceeded from the Certosa near Pavia, and is chiefly characterized in

the rich ornamental work in the pilaster panels, on the archivolts, friezes and arch spandrels, as well as in figure decoration by statues, busts and heads in medallions. The monuments adhere closely in part to the Italian principles of composition; in part they retain the late Gothic basal lines as well as many details (particularly the curtain arches in the windows; page 96), and they employ the Renaissance forms for portals, bay windows and gables. To the latter kind belongs the George building of the palace at Dresden (after 1530), built by Hans Schickentanz, from which still remains the rich George gate (the former portal on the Elbe side). (Fig. 354).*

The main structure of the palace was erected after 1547 by Caspar Voigt of Wierandt. On it were also employed Italian workmen. Of the design of that time is now preserved scarcely more than the impressive court with the stately stairway towers and the open portico in the middle of the north side. With the more important works of the Saxon early Renaissance is counted the eastern wing of castle Hartenfels near Torgau, built by Conrad Krebs in 1533-1535. Before the court facade is placed a flight of steps and a stairway tower, in which a boldly constructed and splendidly treated winding stairway, recalls much of that of the chateau at Blois, and leads to the upper story. (Page 304**). The real showpiece of Saxon-Silesian early Renaissance is the portal building of the Pfaffen chateau at Brieg (Fig. 355), dating from 1552. Italian artists worked on this. But from its entire composition the design is to be ascribed to a German master. That likewise the private architecture in this domain zealously participated in the development of the Renaissance may be seen by the numerous and in great part very beautiful portals, which have remained from the splendid building period of the Saxon and Silesian countries. About 1560 commenced for them also the high Renaissance, and thenceforth they yielded preeminence to western and northern Germany.

* Compare the George gate with the portal of the cathedral at Como represented by Fig. 212.

** See page 304.*

In Franconia After 1554 originated the Plessenburg built by margrave George Friedrich of Brandenburg, a regular plan with

four towers. The so-called "beautiful court" is surrounded by very richly ornamented pier arcades in two stories above an undivided or rusticated story. Schweinfurt has in its city hall, erected in 1570 by Julius Hofmann from Halle, an earnest and well subdivided building, which is worthy to stand beside the best works of its kind. The bishops' cities in general are centres of great activity in art. In Würzburg the powerful and architecture-loving prince bishop Julius Echter of Mespelbrunn had the university built in 1582-1591 by the architect H. Kahl as an impressive design, grouped around a nearly square court, on whose southern side stands the university church. This is a three aisled building with galleries arranged after the style of the chateau chapels. Before the piers are placed three-quarter columns in the well known sequence. Among the Würzburg houses of the Renaissance period, there merits consideration the picturesque Sandhof, that originated about 1616, the residence of the old patrician family of Sandhof (Fig. 356). The grandest work of the Franconian late Renaissance is the chateau at Aschaffenburg, erected by the Strasburg master George Riedinger in 1605-1614 for archbishop Johann Schweikard. It has a symmetrical ground plan, indeed produced under French influences, consisting of four wings enclosing a square court, with four massive square towers at the external angles and four smaller stairway towers at the angles of the court. An older tower was included in the rear wing. The facades have merely a horizontal division by bold cornices. The window enclosures already permit the recognition of strong Barocco tendencies. The building has an imposing monumental effect. In Mentz the south wing of the prince elector's palace, begun in 1627, has a very clear subdivision by three correctly arranged pilaster orders. The decorations on the lower third of the shafts and the other rich ornamental accessories have the character of the German rolled work. The architectural details and particularly the window forms were manifestly influenced by French models. On the lower Rhine, where the country shows so much similarity to the Netherlands in regard to climatic and living conditions, and where also an active commerce with them had commen-

commenced at a very early time, the architecture is in close connection with the Netherlands. We find here as there chiefly narrow houses, mostly with three windows and stepped gables. The magnificent portico of the city hall at Cologne (1569-1571) was indded by a native master, Wilhelm Vernicke (Vernickel), but as its creator himself admits, it was designed not without the influence of the Belgian school. The proud structure is arranged in very noble proportions and is distinguished by columns (Fig. 357); it opens in five arches on the facade and two at the side; it has strikingly pure and **entirely** Italian early Renaissance forms. The Jesuit church § 6 at Cologne (1618-1622), probably under the influence of the cathedral, is still chiefly arranged in Gothic as a basilica with slender round pillars and galleries. The net vaults rest on graceful corbels. The architectural details have the character of the late Renaissance, the ornament that of the gristle style, of which it presents one of the earliest examples. In Düsseldorf the church of S. Andreas was built in 1622-1629 as a three aisled hall church and richly decorated.

North Germany has an architectural region in the internal northwest provinces (in the country of Münster, Hanover, Brunswick, Halberstadt, Hildesheim and Hameln), in which the citizens' art was very richly developed, both in stone as well as in wooden construction. The impulses come from the Netherlands in relation to the arrangement of the ground plan (page 279) and the architecture; still the structures exhibit a strong individuality. Here belongs the Rat-catcher's house (Rattenfänger) at Hameln with a high and fancifully bordered gable and luxuriant ornamentation, consisting of decorated ashlar, frequently in chessboard patterns. In Münster the buildings on the architecturally very interesting marketplace mostly have galleries. On the best Renaissance work there, The Stadtwein (city wine) house (about 1615), they are omitted. The Krameramts (merchants' office) house adheres closely to the Netherlandish Renaissance. In Hanover the stately Leibnitz house (1652) strives for a severe organism with regular distribution of the axes. The rich bay window rises from the ground and is a show piece of the Renaissance. In Brunswick on the beautiful Cloth (Lewand) house (1590) by Magnus

Klinge and Balzer Kirchner, the antique forms with a surprising feeling for rhythmic proportions is applied to the low stories of the mediæval structure. A choice show piece of this kind is the house in the Honestrasse at Minden (Fig. 358), distinguished by the richness of its columns. In Paderborn the quite symmetrically arranged city hall (after 1612) has two projections from the main gable end at both angles over open arches with a continuous series of windows in the upper story and ornamental galleries. In Münden the dry and bold facade of the city hall (1605) has a predominating Netherlandish architecture on the three gables set side by side, but otherwise an entirely German character. In Wolfenbüttel Paul Franke (1538-1615), an important and freely creating artist, built the beautiful church of S. Maria (after 1608, first completed in 1660), which exhibits grand proportions as a three aisled hall church of imposing internal effect. The details of the gables arranged beside each other above the side aisles are already given up to a wild gristle style (Fig. 359). His university at Helmstadt (near Brunswick; 1592-1597) is a rectangular building of two high stories, staircase tower, and high gables above the narrow facades and three dormer gables over each longer side, in strong composition and rich treatment. Also the City church at Bückeburg (1615), as whose architect is named Adriaen de Vries, contains an imposing three aisled hall interior, covered by cross vaults on Composite columns (Fig. 360), with well weighed and expressive decoration. The facade goes strongly into Barocco and lacks the character of a church.

In the north German lowlands and the coast provinces Bremen occupies a separate position. To the old city hall there Lüd-der von Bentheim (after 1609) gave a new facade, before which is an arcade portico on Tuscan columns extending the entire width, and a projection rising majestically over its centre, crowned by a stately gable, flanked by two receding dormer gables. The whole exhibits a strong Renaissance architecture with rich sculptured and ornamental decoration, already passing into Barocco. Likewise the interior, particularly the stairs, the corridor in the upper story and the halls are happily composed and splendidly decorated. On the narrow and h

high Essig house, built about 1618, much of the clarity and ornamental effect is lost by the lavish overlaid and rolled ornament dryly and obtrusively spread over all surfaces of the facade. (Fig. 381). The city hall at Emden (1574-1576) in the extreme northwest by Marten Arens of Delft was erected entirely in the Netherlandish style. At Lübeck the Gothic city hall received in 1570 an arched portico with upper story and gable placed before the facade, in the year 1594 on the east side a very rich and nobly treated flight of steps, and in 1586 an already somewhat dryer bay window. The form treatment indeed accepted Netherlandish influences but still retained a certain individuality. From Lübeck spread about the middle of the 16th century a peculiar terra cotta architecture. Portal and window enclosures, horizontal and inclined friezes, figure medallions, also bases, capitals and cornices were made of terra cotta. The predominating style is that of the Netherlandish early Renaissance. The basis of the ornament is formed by broad, dry acanthus leaves and the trefoil with stem, whose point is cut out in semicircular form. The chief domain of this architecture is Mecklenburg, and the principal building is the "Fürstenhof" (prince's court) at Wismar (1553-1554). The broadly developed facade with the richly enclosed triple windows is subdivided by two high parapet figure friezes and on the court side also by pilasters in the two upper stories. The entire conception, that produces such a quiet monumental effect, as well as the details of the architectural treatment, also especially the portals (Fig. 382), permit the assumption of influences from upper Italy. The great chateau of Güstrow in Mecklenburg, built in 1558-1565 by Franciscus Parr, by its grand plan of pavilions, towers and gables recalls the chateaus of the French Renaissance. In Berlin Caspar Theiss, a pupil of the architect of the chateau of Torgau, built the electoral palace (after 1588), of which but few remains exist. To the city hall at Posen Battista di Quadro in the years 1550-1552 added a noble three story facade, opening in continuous loggias, to the structure commenced in Gothic. An entire series of important buildings is shown by Danzig. They adhere closely to the Netherlandish

art and chiefly have Netherlandish masters as their originators. The most important monument is the arsenal, designed in 1600 by Anton van Obbergen from Mechlin, and substantially completed in 1604. It is a rectangular two story structure with sandstone construction at the portals, the window enclosures and the capriciously curved gables (Fig. 363). What wealth was at command here is evident, since partial gilding was applied to the cut stones. In the later works also appears the classical tendency of the Netherlandish Renaissance.

Likewise in adjacent Poland the Renaissance had already found entrance to the splendor-loving royal court of the Jagellons at the beginning of the 15th century, and had been favored by the family relations of the princely house with Italy; splendid works were produced, whose execution was almost exclusively under the charge of Italians. The Jagellon chapel at the cathedral of Cracow is perhaps the most magnificent work of the Italian Renaissance north of the Alps.

In Germany the architectural activity also continued during the first half of the thirty years' war until about 1630. Only in the second part of this occurred those miserable conditions, which had an unequalled national weakness and poverty as a result, and the artistic energies of the citizen class, that took the lead in art during the age of the Renaissance, and had developed such varied and luxuriant prosperity, were entirely crippled. After the war a new period in architecture also commenced in Germany, as well as in the other arts; then began the supremacy of the international Barocco style, chiefly supported by the endeavors of absolute princes.

3. Denmark.

After the so-called union of Colmar (1397), Denmark exercised supremacy over the three Scandinavian kingdoms of Denmark, Sweden and Norway, but lost this over Sweden under Christian II (1503-1523), which then entirely freed itself from Denmark. Violent tumults in the interior and unfortunate external complications, especially by means of wars with Sweden, in the 16th century hindered the free and independent development of Denmark. Under the long reign of its brave and energetic king Christian IV (1596-1648) occurred a national advance, w

which was also expressed in art. In the second half of the 17th century this continued under the favoring influence of the gradually appearing political quiet. But first in the 18th century (after 1730) a longer period of peace was assigned to the country, in which by the practice of agriculture, commerce and manufactures, it developed into comfort and well-being.

The Renaissance entered Denmark comparatively late. It was at first based chiefly on German influences, but later was in almost entire dependence upon Netherlandish art, which indeed in part directly penetrated, partly by the mediation of the north German coast lands. Under the art-loving king Christian IV, the Renaissance style developed in a manner characterizing the Danish individuality. It adopted the grand lines of the Netherlandish, but worked in its own way. Characteristic for it is an excellent grouping of the architectural masses with a somewhat repressed architectural subdivision and the adoption of early Renaissance motives and decorations. The Danish Renaissance merits our consideration; for in its works it brings out their architectural purpose with particularly clear expression.

The first important work is the chateau of Kronborg near Helsingør (1574-1585), a massive ashlar structure with great undivided wall surfaces, grouped around a square court, with few but relatively large windows divided by mullions, rich and low roof cornices and capriciously curved gables. The form treatment is expressly German, and in any case without direct adherence to Netherlandish models. The most important monument is the chateau of Fredericksborg, erected by Christian IV in 1602-1625. It lies on three islands connected by bridges, the first of which contains the external forecourt with the housekeeping buildings, the second the lower court flanked by two story government structures. On the third island lies the main building composed of three wings, which enclose the court of honor on three sides. (Fig. 364). The court design makes an imposing and harmonious impression by the well weighed proportions, the great tower, the small stairway towers, by the open two story arcade porticos on the rear wing.

and by the harmonious treatment of the whole and the details. The portals and the arcades exhibit a rich and strong architecture. (Fig. 365). Besides the other rooms in the interior, particularly the Ritter hall and the chapel are magnificently handled in the style of the mature northern Renaissance. The creator of the design is unknown. It is assumed that the king himself furnished the basal ideas. In the erection the younger Hans von Steenwinkel and also probably the Netherlander Anton van Obbergen, employed in Danzig, took part. Somewhat later was erected in the same style the considerably smaller but lofty chateau of Rosenborg in Copenhagen (1610-1623). Christian IV directly busied himself with its design. It consists of a rectangular wing with bay windows and gables on the ends, a small polygonal stairway tower, at the sides two slender square towers on the facade (Fig. 366), and a massive principal tower in the middle of the rear side. The interior of the building, for which the king always exhibited a preference, was comfortably equipped, but later was much changed. To the same time belongs the Exchange (Bourse) in Copenhagen (after 1610), erected at the harbor by Hans von Steenwinkel the Younger. It is an elongated two story pavilion with a subdivision of the facade by hermes, impressive portals and gables on the front and an animated outline of the roof, produced by the roof gables set along the main facade and the wonderfully shaped spire of the tower in the form of four dragons' tails twisted together. The interior originally had two long corridors along which were arranged sale booths on both sides. The most mature work of Steenwinkel is the tomb chapel at the cathedral of Roskilde (1617), impressive both externally and internally. To church architecture was directly transferred the style of the chateau architecture. Therefore they mostly appear as slightly developed organic creations; also they make the impression of a rather timid freedom from the Gothic. The chief work of Danish church architecture is the Trinity church, founded in 1637 in Copenhagen by Christian IV. It is an externally heavy but internally eariest and grand hall building with still entirely Gothic ceiling vaults. Over the interior of the church is found a great li-

library hall. The remarkable round tower terminating in a platform was intended for astronomical observations (it includes a comfortable ascending helical ramp, wide enough to drive up a carriage with four horses. * Among the works of the citizens' architecture the first place is taken by the so-called "Dyvekes house" in Copenhagen, built in 1616 by the burgomaster Hansen. It is a three story structure with two gables rising beside each other over the longer facade, kept in the Netherlandish style, yet not without reminiscences of German art, particularly of the arsenal in Danzig.

* To the monuments of Danish church architecture, strictly speaking, also belongs the Trinity church at Kristianstad. (page 324: Fig. 369).

Soon after the middle of the 17th century followed the transition of the Danish Renaissance to the Barocco style.

In Norway, that remained united to Denmark until the year 1814, and this time was dependent on Denmark in language and literature as well as in art. The primary conditions were wanting for a further spread of the massive construction chiefly coming in consideration for the Renaissance. As a natural stone, chiefly granite difficult to work was at command; the making of bricks was limited to the smaller region of the south. Consequently Norway scarcely advanced beyond the ancient native wooden architecture, that grew up with the people on the soil. Indeed the Renaissance also there influenced the structural framework and the ornamental details. But important monuments cannot be indicated.

32. 4. Sweden.

With the declaration of its independence from Denmark and the restoration of the national by Gustavus Vasa (1523), Sweden entered on an unexpected advance, which brought to it a very important position among European nations, and the importance of a northern great power by the participation of Gustavus Adolphus (1611-1632) in the thirty years' war. The Vasa period -- Gustavus Vasa and his immediate successors Eric XIV (1560-1568) and Johann II (died 1592) showed themselves to be zealous patrons of art -- so magnificent for the political development of the kingdom, was especially favorable for the flourishing of architecture, and thereby for the entrance of

the Renaissance. In its course may be distinguished two divisions, the early period till 1600 and the late period until 1650. The former corresponds in the history of development to the early Renaissance, the latter to the high Renaissance.*

** The Swedish late Renaissance falls in the period of the Barocco and Rococo styles. We shall therefore treat it in the succeeding chapter. (Volume 3).*

The formation of the style was thus substantially completed as in the other German countries. At least on the more important monuments, architecture was chiefly practiced by foreigners, indeed by Netherlanders and Germans; therefore is determinative sometimes the Netherlandish, and sometimes the German influence. In general the Swedish Renaissance adheres more closely to the German than the Danish. In the early Vasa period (1523-1600) the mediaeval mode of thought still predominated. On the few churches Gothic forms were still employed in details. The great chateaus of the royal family and of the high nobility were mostly composed of several wings, that were grouped around an open court with round or square towers at the angles. Until the end of the 16th century the exterior was enclosed like a fortress; the wall surfaces remained undivided and the chief weight was laid on solid bonding. The design of the windows was still irregular. In the arrangement of the rooms and stairways little attention was paid to convenience. The Renaissance was chiefly employed on details, on the portals, gables and on the decoration. The country seats of the nobility in the 16th century were principally structural groups like great farmsteads and enclosed by palisades or hedges. If they were treated as permanent dwellings, they mostly had a modest extent in the form of high rectangular stone structures without external subdivision. Only the portals and gables sometimes received an architectural treatment. The citizens' dwellings in the cities were narrow houses with three or four windows in front, simple portals and stepped or curved gables in the style of the Netherlandish-German Renaissance. In the decorative motives was preferred the German so-called Aldegrevor ornament with the long-stemmed trefoil leaves. (Page 276). The later Vasa period (1600-1650) brings a decided endeavor for regularity of the plan of the building

and an appropriate and convenient arrangement of rooms. On the other hand the care in the treatment of details is diminished. The details ever more fall into a certain dryness and tastelessness, probably partly due to overproduction. Likewise in this period the chief attention is devoted to the portals and gables. About the end of the 17th century became perceptible numerous Barocco tendencies in the general design as well as in the architecture and decoration, besides classicistic attempts in the sense of the Netherlandish conceptions. The latter attained full supremacy first in the second half of this century.

Among the monuments of the early Vasa period, the chateau of Gripsholm is the first important work. (Södermanland; 1537-1596). It still has the irregular plan of a mediaeval castle with two courts, strong towers and undivided walls of red brickwork. The water chateau of Wadstena (after 1535) has an entirely symmetrical plan as an unusually elongated narrow rectangle, whose front side is protected by low and massive round towers as bastions. From about 1560 onward the chateau of Kalmar, dating from the middle ages, was changed into a modern fortress by extensive new structures. The buildings forming its nucleus are picturesquely grouped around an irregular court with round or polygonal angle towers. The wall surfaces are undivided up to the gables. Strongly projecting bulwarks emphasize the fortress character. (Fig. 367). The portals exhibit the predominant style of the developed German Renaissance, yet have a remarkably distinguished and classical expression. Entirely classical is the beautiful fountain in the court (about 1530), which closely adheres to the late Renaissance of upper Italy. * In the interior is the striking apartment of king Eric XIV, it has a monumental tendency and is very well preserved in its former condition. (Fig. 368). It has a strong subdivision of the walls by Corinthian three-quarter columns with heavy cornice and a magnificent ceiling, properly harmonized therewith in its ornamentation.

** In the library of king Eric XIV was found an edition of Vitruvius' works, besides other books on the literature of art.*

To the later Vasa period belongs chateau Wibyholm (completed

1326), whose three wings are grouped around a court. The architecture shows a mixture of the Netherlandish brick style with German forms. Chateau Jacobsdahl (1344) has a wide court, open in front. The main building is subdivided by a colossal pilaster order in the Dutch style. The general design and architecture exhibits numerous Barocco tendencies. Among the private buildings the Petersen house at Stockholm, built before the middle of the 17th century, still has a facade developed to the width of a palace with seven window axes and four stories (the uppermost treated as a half story), and graceful portal and gable architecture in the style of the Netherlandish Renaissance. The same character is borne by a group of narrow and high houses standing on the great marketplace, which already exhibit Barocco reminiscences in the treatment of the portal and the gable.

Church architecture in the first Vasa period is best represented by the church of S. Jacob in Stockholm (after 1533), a still entirely Gothic plan with three stories and six bays in the nave and star vaults. Only on the portals and the gables, which are treated like the gables of palaces and houses, is expressed the Renaissance. The most important church building of the second Vasa period is the Trinity church at Kristianstad, begun in 1313 by king Christian IV of Denmark at a time, when the city was still Danish. It consists of a rectangular and wide three aisled nave, which at the middle is enlarged at both sides by an addition like a transept. Two rows of five in each of high and unusually slender octagonal granite piers support transverse arches, on which rest ribbed cross vaults in the Gothic style. The exterior bears the character of the Danish Renaissance by the combination of red bricks with cut stone, by the ashlar angles and bands, and the seven volute gables, treated just like those on houses. (Fig. 369). The architect is unknown. Indeed there also the architecture-loving and art-loving king determined the dominating lines of the design. The Riddarsholm church at Stockholm, transformed from an old Franciscan church and extended by the addition of an entire series of tomb chapels, chiefly possesses importance as the resting place of the Swedish kings (Gustavus Adolphus and others), as well as of the great of the country.

V. RENAISSANCE ARCHITECTURE IN ENGLAND.

A. Historical Development and Style.

England entered the period of the Renaissance under the House of Tudor (1485-1603). The last queen of that House, Elizabeth (1558-1603), increased the prosperity of the country by economical rule and effective administration of justice, strengthened the sea power, founded colonies in North America and the East Indies, and laid the foundation for the later position of the British monarchy as a great power. Under her successor, James I, king of Scotland (1603-1625), the three British kingdoms of England, Scotland and Ireland were united in a national union. In spite of the violent internal disturbances, chiefly owing to religion and the rising of the people against the reduction of their rights, and the several foreign wars against Holland, Spain and France, the prosperity continued in the entire 17 th century. In the 18 th century England, in consequence of its fortunate internal and external politics, rose to that position as a world power dominating all the oceans, which it has maintained to the present day.

As the political history of England was carried on quite independently, thanks to its favorable geographical location, the individuality of its national character and its prominent colonial activity, so likewise the art history took an independent development. At a time in which humanism, Renaissance and reformation in other countries had produced an almost complete break with the past, in England the sound conservative sense of the people with the tough force innate within it long adhered to mediaeval traditions. First in the second half of the 16 th century, under the reign of queen Elizabeth, was continued the mighty movement already brought a century earlier from Italy across the channel. The general conditions there were especially favorable for the acceptance of new intellectual and artistic ideas. The concentration of the commerce of the world on the English coasts and the development of the capital at London as a European market wrought a transformation in the economic and social conditions. The tales of the wealth of the new world fostered not only an adventurous spirit to the utmost, they also contributed to an easy a

and lavish tendency of life. The England of queen Elisabeth was inferior in the enjoyment of life to no other country. Her age was one of the most splendid in England's political history. The victorious contest with Spain, then the greatest power, had produced an elevated feeling of joy in the national existence, to which its poet Shakespeare (1564-1616) gave eloquent expression. In his works appeared the signs of the time, in the South and also here, mighty passions and afflictions in superhuman strength.

Of all the arts, architecture in England was most closely connected with the people and the occurrences of their lives. From the great economic and national elevation and the changed intellectual tendency, it received the strongest impulses. The rich merchants developed the idea of home comfort in the satisfaction of their increased requirements for their dwellings in regard to their location, number, size, arrangement and treatment of the rooms. The cities received a changed appearance. The rule of the citizen class already became evident in their architectural style. The nobility lost its warlike and defiant character. At their castles the earlier and often gloomy rooms arranged for attack and defense now gave place to light and splendid porticos. For the seats of the nobles, as for the royal court, the endeavor for comfort and refinement of the entire life was determinative.

The Renaissance forms occasionally appeared already before the middle of the 16th century, but first during the reign of queen Elisabeth were generally accepted. She indeed gave but unimportant architectural commissions (gallery in Windsor), but supplied the nobility with animated impulses for the erection of palaces and country seats. The advancement of the Renaissance was based more on foreign influences and theoretical studies, than on an innate art sense. Already Holbein the Younger (page 296) contributed on his first journey to England (1526) and later during his permanent stay there (after 1532) much to the knowledge of the new style and to its extension. In the year 1533 an Englishman, John Shute, after having been in Italy, published the first English work on the columnar orders; later the writings of Philibert de l'Orme were also translated into English.

As in all northern countries, the Renaissance elements first appeared as added ornamental forms, without substantially changing the mediaeval system of construction. Thus originated a picturesque and very charming mixture of the Renaissance with the Tudor style, in which the mediaeval motives were gradually suppressed, while those of the Renaissance experienced an increasing refinement. Under James I (1603-1625) the treatment of forms was already tolerably pure, even if the mediaeval mode still reacted. But under his successor Charles I (1625-1649) the Renaissance predominated in its entire purity. The art-loving king maintained intimate relations with two Dutch painters, Rubens and Vandyke, even collected art treasures, and was inclined to Romanism as in his political and religious opinions, so that the Renaissance found in him a zealous patron. In the second half of the 17th century (after 1665) appeared a strong theoretical tendency in English architecture, that continued until the beginning of Neoclassicism (middle of the 18th century).

Accordingly three periods are to be distinguished in the evolution of the English Renaissance, the early Renaissance of about 1560-1625 -- the English subdivide this period into two sections, those of the Elisabethan and of the Jacobean styles * -- the high Renaissance from 1625 to 1665, and the late Renaissance from 1665 to 1750. The latter period falls entirely in the time of the Barocco and Rococo styles.

** In England after the French example, from the beginning of the Renaissance the distinct style tendencies of English architecture were named after the monarchs then reigning.*

In regard to the treatment of the style, the early Renaissance is particularly interesting, since it bears an independent and entirely national character. It is most clearly expressed on the palaces and the country seats of the nobility. The English country seat preserves the national tradition and thereby differs as much from the Italian palaces as from the French chateaus. It was located in the green landscape as if it had grown there, so that it might afford as many and as charming views of the park as possible. Men therefore arranged, in order to also provide side windows for the more impor-

360 important rooms, several projections and recessions in the ground plan, without taking thorough care for the development of a facade in a plane, and chiefly sought to obtain picturesque effects. On these principles could be developed no fixed architectural system. For the extensive structures the ground plan generally shows an arrangement of three wings of the building in the form of a Latin H. Great and well lighted entrance halls, spacious and richly treated stairways (Fig. 370), long and wide galleries are the rooms preferred by location and treatment. Around them are grouped the proper living apartments and the subordinate rooms. The stairs were generally constructed of wood; they have richly carved railings. In the living rooms (Fig. 371) the colossal mantle forms the principal object of the decoration and not seldom extends from floor to ceiling. The bay windows and walls were preferably covered by finely treated wooden paneling, frequently for the entire height of the walls. For the ceiling in a striking way wooden construction was but seldom chosen; stucco was preferred, indeed as an innovation on the former mode of treatment, and to which was given a subdivision into small panels by curved projecting mouldings, with rosettes and sometimes even hanging pendants (in imitation of the late Gothic pendants) at the intersections of the bands. On the exterior the characteristic marks consist of porticos with columns and richly treated heraldic ornamentation, later in several storied and portal structures rising like towers with columns set in pairs (Fig. 375), very large windows divided by several mullions and cross bars, the bay window with m mullions, perforated balustrades, simple narrow curved gables, behind them being concealed the roofs, bay and bell turrets, and numerous strongly accented chimneys, mostly in the form of columns (Fig. 372). In the details is found a bold combination of inorganic forms (Tudor and pointed windows are not seldom flanked by Renaissance pilasters, classical window enclosures cling beneath Gothic gables; yet a certain unity cannot be denied to the whole, so that a tasteful effect is produced. After the forms of details had also become clarified and complete purity had been won (about 1600), the Gothic still influenced the arrangement of the members and the extended

proportions (Figs. 373, 376). The amount of stone and stucco decoration at first seems to have been chiefly foliage in the hollows and friezes, and it is very similar in modeling to that of the French Renaissance of Francis I; later it passes into the style of the German overlaid and rolled work.

The chateaus mostly rise from great terraces, from which steps lead down into the lower ornamental gardens, laid out in the Italian taste, which in their turn were again enclosed from the external park by fine ornamental grilles. Besides stone construction in the English early Renaissance wood construction also was highly developed. Not only in the country but also in the cities are preserved a great number of charming monuments, thanks to the durability of the materials (mostly walnut or oak). On the houses the greater part of the surface of the facade is occupied by windows, frequently so much so that the front walls appear to be constructed of wooden framework with glass panels. The country seats as a rule do not exceed two stories. But in the cities the wooden houses have several stories projecting beyond each other with bay windows and steep gables. The effect is based on the proportions of the openings to the wall surfaces, and in these on the alternation of woodwork and plastered surfaces. Characteristic is the parallel portions of the vertical posts and of the oblique ties, repeated with such narrow intervals, that only a narrow strip of wall lies between them, about the width of the timbers. Otherwise the chief decoration is formed by crossed circular and quatrefoil cut timbers (page 88; Fig. 374). Surface ornaments likewise occur generally, but actual works of the sculptor are rare.

The Elisabethan style also continued under the reign of James I (1603-1625), indeed with increasing refinement. With the end of the first quarter of the 17th century, the style matured into the high Renaissance. The Italian series of forms was adopted with all its consequences, under the lead of a great master trained in Italy, indeed in the conception represented by Palladio. Thus arose on English soil buildings, which charm us, even if creations from the school of the great Vicentine were to be transferred to the high North. The activity of the principal master was at this stage rather as

designing in the same spirit, than as imitating. In the late Renaissance the form canon became in general more severe and was handled in a more calculated manner. The architecture in its grand designs frequently makes an imposing impression; but the details often appear cold and lifeless. This tendency corresponded so strongly to the English art spirit, that it opposed an insurmountable obstacle to the victorious course of the Barocco style, penetrating into nearly all civilized countries about the end of the 17th century.

B. The Most Important Monuments.

The earliest work of the English Renaissance is the tomb of Henry VII and his wife in Westminster Abbey (1518), by Pietro Torregiano from Florence, a fellow pupil of Michelangelo. It is a splendid free structure of marble with arcades on piers, most richly adorned by sculptures. Likewise the first great chateau of the early Renaissance was by an Italian, Longleat House, erected in 1567-1579 by Giovanni of Padua. The architecture is restrained in tolerably severe forms. But in the ground plan the master followed the custom of the country, when he subdivided the facade of the rectangular design by many projections and treated the two small courts as merely light courts. As the first native architect is named John Shute, already known by his literary labors (page 328), and architect of the queen. His practical activity as such was of but brief duration; he died in 1584. He was succeeded by John Thorpe, the great master of the early English Renaissance. He began his abundant activity about 1570. He passes as the creator of the most important country seats of that time. Burleigh House (1577), whose garden front is entirely resolved into narrow wall surfaces by projecting facades and polygonal towers; Wollaton Hall in Nottinghamshire (1580-1588), that exhibits a massive middle building with angle structures like towers, already decidedly adopting Renaissance forms by the use of pilasters and columns in the usual sequence, yet retaining the great mullioned windows and with graceful gables on the angle buildings, which are imitated from the Netherlandish; Longford Castle near Salisbury (1591-1602) with proud, low and very broad round towers at the angles and open

loggias in two stories on the middle structure of the main facade; Holland House in Kensington near London (completed in 1607), distinguished by picturesque grouping, rich and varied external architecture and numerous gables; Hatfield House in Hertfordshire (built in 1611) with splendid treatment externally and internally. (Figs. 375, 376). The middle building of the garden facade is indeed the most magnificent show piece in cut stone architecture of the developed English Renaissance. Likewise a great number of "Colleges" (page 115) in Cambridge and Oxford expressly present examples of the Elizabethan style. At the entrance of the Bodleian Library at Oxford, Thomas Holt in 1597-1602 placed five stories of columnar orders over each other, that are coupled in pairs and flank the round-arched portal as well as the mullioned window. One of the latest principal works of the early Renaissance is 392 Aston Hall near Birmingham (1618-1635), a relatively simple building, but characteristic for the greater number of the English country seats of this time. (Fig. 372). Besides the seats of the nobility and the public buildings, the citizens' architecture of the early Renaissance in an entire series of cities is represented by works meriting consideration, both in stone and in wooden construction.

The chief master of the English high Renaissance was Inigo Jones (1573-1651), whom the English revere as their greatest architect. He was twice in Italy for continued studies, and there became a zealous representative of the tendency of Palladio. No other northern master entered so deeply into his spirit as Jones. His architectural activity commenced about 1604. In the year 1615 the king appointed him superintendent of buildings. Soon afterwards he designed by order his chief work, a colossal palace for London, which in a later second design he enlarged into a still greater design. According to this the structures formed a rectangle 1200 × 399 ft. and were grouped around seven courts, an elongated middle court and three smaller courts at each side. The middle ones of these were designed as arcaded courts. Unfortunately only the banquet hall, Whitehall, was completed, having a width of seven window axes. The structure closely adheres to Palladio's works. (Fig. 377). Only in one point the British master did not

not tread in the footsteps of his Italian instructor; he made no use of the combination of several stories. * Whitehall is in two stories. The proud facade above a rusticated base has on the four inner window piers three-quarter columns of the Ionic order in the lower and of the Corinthian in the upper story, at each side of the outer windows being a pilaster with coupled columns at both angles. Above the main cornice extends a crowning balustrade. On the garden facade of St. John's college in Oxford (1631-1635), Jones adhered to tradition in the arrangement, still clothing the structural members in Renaissance forms. Of his other works are to be mentioned :- Raynham Hall in Norfolk (1630), the former villa of the queen in the park of Greenwich, whose middle projection in the upper story was resolved into a loggia with six columns; Wilton House in Salisbury (1640) with the splendid rooms known as the "single and double cubes", as well as Ashburnham House in Westminster with an imposing stairway. On the church of St. Paul in Covent Garden at London he built a portico, where he first transferred the scheme of the columnar temple with Corinthian columns and angle piers to church architecture. As a particularly beautiful work was esteemed the no longer existing facade of Somerset House.

Jones was one of the great masters of architecture. He most strikingly embodied the ground principles established by himself:- "Order in the treatment of buildings, solidity in construction, strength and freshness in style". He was a master in dominating architectural masses and in establishing the proportions, grand in the architectural disposition, distinguished in architectural expression, avoiding everything merely external and little. His works are characterized as unified creations of an artistic individuality, full of character, mature, with a sovereign certainty of the treatment of interiors in materials and forms.

After his death occurred a period of repose in the development of English architecture. It first arose in a new advance at the time, when Christopher Wren, the principal master of the English late Renaissance began his epoch-making activity. The creations of this successor, allied to the great

Jones in spirit, originated in the period of the Barocco style. We shall therefore consider them in the next volume.

* ,ater masters, John Vanbrugh, James Gibbs and others generally employed the colossal order.

Concert Hall in Leipzig, completed in 1884 by his associate S Schmieden, that in its Hellenistic-Classistic Renaissance produced a very distinguished impression. Herman Ende (1830-1907) treated the Museum of Ethnology at Berlin (1880-1886) in the heaviest forms of the Italian high Renaissance, particularly in its circular building constructed at the corner of two streets. Kayser and von Grosheim passed from the Italian to the German Renaissance in the Buchhändlerhaus (Book-dealer's house), which they created in Leipzig (1886). Later they turned to Schlüter's parocco. Berlin architecture of modern times reached the climax in the Reichstagshaus (Diet Palace) erected by Paul Wallot (page 324) (Fig. 272), which rises on an area 450.8×306.1 ft. with an assured mastery of the internal treatment and of the architectural masses, developed on a Classic-Barocco basis, full of character, with an architecture in the form combination of aspiring forces, strikingly expressing the purpose of the structure, and to be counted with the most prominent secular works of the 19th century.

In Leipzig Ludwig Hoffman and Paul Dybwad erected the building of the Imperial Courts (Reichsgerichts) (1887-1895); the architectural masses are dominated by a mighty dome and exhibit a dignified Classicistic clarified architecture holding a mean between the Italian and the French Renaissance. The Grassi museum (completed 1895) was created by Hugo Licht (born 1842), a pupil of Lucae, has a highly monumental effect by its facade of 12 Composite columns, recalling palace Czernin in Prague (page 160), which stand on a rusticated lower story and extend through two stories. The same master gave a very good example in the rebuilding of the city hall at Leipzig, grouped around the principal tower of the old Pleissenburg, for the utilizing of the native Renaissance, rooted in the spirit of the locality, in a very picturesque conception.

At Hanover Carl Wilh. Hase (1818-1902), an important representative of north German brick Gothic, and a highly esteemed instructor at the Polytechnic school, to whom adhered a widely branches school as the "German Viollet-le-Duc". Hase restored with thorough understanding and reverence a great number of mediaeval churches, erected at Hanover the Provincial Museum (1853-1856) in a modern conceived Romanesque style, the Gh-

Christus church (1859-1864) as a cross-shaped basilica in the style of the developed north German early Gothic, to which the master and his school remained faithful for a long time. His chief work was the restoration of the Marienburg, which his pupil Edwin Oppler (1831-1900) completed, and who had also worked under Viollet-le-Duc.

In Cologne the renewal of the works for the completion of the cathedral, which required an expenditure of six million dollars, and was regarded as a national problem for the entire German people, afforded particular evidence of the swelling waves of inspiration for the middle ages. As the leading architects were employed Architectural Inspector Ahlert from 1824 to 1833, and after him on Schinkel's recommendation Ernest Fried. Zwirner (1802-1861), particularly important as a constructor, and after his death, Richard Voigtel (1829-1902). The cathedral was completed in the year 1880. The severity of the prevailing esthetic conception, which employed similar masters everywhere, that the same structural problem was to be solved or indicated, led to a certain monotony, which distinguish the new portions of the structure from the older ones, created rather according to freer artistic views. Among the numerous great churches, which were restored and completed in the 19th century -- there may be mentioned here only the cathedral at Spire by Hübsch, the minster at Ulm by Thrän, Scher and Beyer, the cathedral at Regensburg by Densinger -- the construction of the cathedral of Cologne occupies the first place.

In Karlsruhe the Museum for the combined collections (1865-1870) erected by Joseph Berkmüller (1800-1879) bears the stamp of a still pedantically conceived Italian high Renaissance. After him, Architectural Director and Professor in the Polytechnic school, Joseph Durm,* also very fertile as a writer on architecture (born 1837), was the most influential representative of the Renaissance. On his most prominent buildings, the Festhalle (Festal hall), palace Schmieder (now palace of prince Max), and palace of the hereditary grand duke in Karlsruhe, appears a transition from the at first refined Hellenistic conceptions to a stately and extremely rich Italian high Renaissance, and from this to the Barocco. In contrast to him was Carl Schäfer (1844-1908), esteemed as a Gothicismist and instruc-

instructor at the Polytechnic school, whose principal work was the University hall at Marburg. About the end of the 19th century the architectural firm of Gurjel & Moser stood in the foreground of architectural activity in Karlsruhe. In their church buildings, such as the Christus church at Karlsruhe and the church of S. Johann at Mannheim, they show themselves adherents of a picturesque and freely designed mediaeval conception; on the contrary in their secular buildings (palace of crown prince in Karlsruhe) they fall into the ranks of modern artists. In Mannheim Bruno Schmitz (born 1856), well known as an architect of memorials (Kyffhaus monument), created the Rosengarten (Fig. 273), a concert and festival hall, in which is shown the transition to the newest tendency in art, freeing itself from all historical forms.

** Durm's most important works on the history of architecture are: Baukunst der Griechen, Baukunst der Etrusker und der Römer, and Baukunst der Renaissance in Italien, in the Handbuch der Architektur.*

Stuttgart received in the Villa Wilhelma one treated entirely in the Moorish style, built in 1842-1852 by Carl Ludw. Wilh. Zanth (1796-1857). The Royal building (Königsbau) designed by the Classicist Joh. Mich. Knapp (1793-1856) and executed by Chr. Fried. Leins (1814-1892), is a still strongly classic building, touched by the early work of the Renaissance, opening in a great colonnade toward the Schloss Place. The picturesque Protestant church of S. Johann (1866-1876) located on Lake Feuer, Leins treated charmingly in the Gothic cathedral system of the best period, but without finding the correct scale for the proportion of the whole to the abundance of decorative forms. Joseph von Egle (1818-1899), an influential instructor in the Stuttgart Polytechnic school, erected in Stuttgart the Polytechnic school (1860-1863) in an Italian high Renaissance, permeated by French motives, and the Maria church as a hall structure in the forms of the early Gothic. Skjold Neckelmann was the creator of the State Industrial (Landesgewerbe) Museum (1890-1896), treated in a bombastic early Barocco, whose principal room, the King Carl Hall, is showily decorated. The latest monumental building of Swabia was erected by J. Vollmer and H. Jassoy in the City Hall at Stuttgart, com-

completed in 1905, which in its modernized Gothic forms fits very well into the view of the city.

In Munich about the middle of the 19th century, Fried. Bürklein (1813-1872), at the desire of the king, who wished to have a new architectural style, made the attempt to fuse together mediaeval and antique form elements, without thereby attaining to an organic unity of style. The Maximilaneum erected by him on a dominant terrace as a termination of the Maximilianstrasse, conceived in Gothic but translated into Italian Renaissance by the influence of Semper, and the Government Building (1858-1864), rather representing mediaeval forms, can be just as little satisfactory, as the opposite Old National Museum, built by Edward Riedel (1813-1885). Freedom from this unfortunate "Maximilian style" came to Munich architecture with the appearance of Gottfr. von Neureuther (1811-1887), a pupil of Gärtner and a zealous advocate of the Italian Renaissance. His Polytechnic School there (1866-1870) is characterized by picturesque design and refined feeling for the treatment of details. (Fig. 274). The Academy of Art (1873-1885), both in the arrangement of the ground plan, as well as the grand treatment of the facade and the careful erection (the facades are of marble) is an equally distinguished architectural work.

The accession of Louis II (1864) was important for the architecture of the Bavarian court, in so far that the art-loving young king showed from the first an unusual desire to build. He followed his romantic enthusiasm, and for the embodiment of his ideas called an architect, who possessed neither the power nor the capacity to guide the rich endowment of the king into fruitful paths. Thus under the charge of George Dollmann (1830-1895), a pupil of Klenze, and with the assistance of Joseph Hoffmann (1840-1896), the capricious chateaus of the Bavarian king, the ^{new} Royal chateau of Linderhof (1869-1878), located in direct isolation in the forest of upper Bavaria, the chateau of Neuschwanstein (1869-1886), fabulous as a theatre and decoration changed into stone, and built in a charming Alpine landscape, designed by the court painter of the theatre, Chr. Plank, with the rich internal ornamentation (Fig. 275), and finally the chateau of Herrenchiemsee (1878-1885), produced in veneration of the sun king Louis XIV and imitated from Versailles

Likewise in the art of the citizens of Munich was expressed the inclination of the character of the people toward picturesque treatment. Meanwhile and under the influence indeed of the "old German" art industries enjoying high esteem in Munich, for which George Hirth had opened the way in literature with his "Formenschatz der Renaissance" and his "Deutschen Zimmer", this had turned to the German Renaissance with its picturesque grouping, bay windows, gables and small towers. Lorenz Gedon (1843-1883), highly gifted as architect and also as sculptor, aroused very great attention to this by his rebuilding of the Gallery of count Schack (1872-1874) in an extremely rich and freely conceived German Renaissance. Gedon later devoted himself entirely to the decorative arts. His exuberant imagination soon found the way to the Barocco and the Rococo, for which he prepared the ground by his influence in architecture. The middle ages further celebrated a revival in Munich in the city hall erected in 1867-1879. (Fig. 278). In the competition preceding it, George Hauberissen won the victory (born 1841), who had educated himself in the Munich, Berlin and Vienna schools (there under Schmidt, page 333) for great creations, chiefly by his design calculated for picturesque effect.*

66. The most amiable and intellectual later representative of the German Renaissance in a deeper but freer conception is Gabriel Seidl (born 1848). All his works are very effective in general, individual in details, dignified and attractive by the harmonious decoration. His monumental church of S. Anna at Munich (dedicated 1893) is treated in the southern German Romanesque style, the Künstler (Artists') House is in external appearance in German Renaissance, but the great hall is splendid in a freely transferred early Italian Renaissance, treated with refined feeling. Gabriel Seidl's most important building is the (New) National Museum (1894-1900). In the design of the structure and the treatment of the interiors, in which the native art was to be represented, where style conditions are indeed in place with regard to their historical presuppositions, Seidl showed himself a distinguished eclectic of refined feeling. For each connected group according to place and time, he created a corresponding interior, which was also characterized as such externally. The different parts of the building are

picturesquely combined in an unconstrained manner. (Fig. 277). Besides Seidl, **Friedrich Thiersch** (born 1852) worked in Munich, who in his colossal Palace of Justice (1891-1897) erected a Barocco structure of dignified and highly monumental effect. Since the end of the 19th century came into use a citizens' and cheerfully attractive Barocco, which by a series of architects of modern ideas has been transformed in the modern spirit.

** Hauberisser was otherwise an adherent of the German Renaissance, which he very expressively showed on his city hall at Wiesbaden.*

The architecture of SWITZERLAND received a great advance through Semper (page 332). The Italian Renaissance entirely dominates the field of work, often with a Barocco addition showing itself in the ornament. On a great number of banks, commercial and residence buildings, it came into use, partly in a monumental treatment. In Zurich the Northeastern Railway station (Fig. 278) erected by J. F. Waner permits the direct recognition of Semper's influence. The Neo-Romantic is only represented by a prominent work in the picturesque Landes (National) museum (1892-1898), built by Gull. The magnificent Ton-
33- (concert) hall (1893-1895); Fig. 279) was created by the Vienna architects Fellner and Helmer. In the federal capital of Berne, Studer built in 1857 the Federal Legislative Building (Bundesratsgebäude) in the Florentine palace style of the early Renaissance. From 1894-1902 it was enlarged into a design of grand style by the gifted Hans Auer (1847-1906) a pupil of Semper and assistant of Theophilus Hansen (page 304). The imposing middle portion, containing the hall of representatives, projects in semicircular form above a massive rusticated lower story, with a colossal Composite order of columns, flanked by two towers and covered by a dome for admitting light. The form treatment is a mean between the Florentine early and high Renaissance, and is very happily adapted to the earlier building. It lends to the palace, enthroned majestically above the deeply sunken valley of the Aar, an extremely dignified impression. In the most recent time the architecture of Berne has turned to the Barocco style, existing there in numerous works of the 18th century, which by original treatment of the details, and particularly by the great projection of the roof pec

peculiar from ancient times to the houses of Berne, and has experienced a national transformation.

333 The imperial AUSTRIAN city of Vienna became an important centre of art culture in the second half of the 19th century. The fortifications, that surrounded the old city and thus obstructed a free development of architectural activity, were torn down (after 1858). In their places originated the great Ringstrasse, on which rose one magnificent structure after another. After the middle of the century, Edward von der Null (1812-1868) and August von Siccardsburg (1813-1868) by their joint labors broke out a freer path. On their principal work, the Grand Opera (1861-1869), which opens in a doubled loggia to the Ringstrasse and is richly treated in the external architecture as well as the internal decoration; they employed the forms of the developed Italian and French early Renaissance in happy combination. But the direction struck out by them excited no great imitation. In the year 1846 the Dane, Theophilus Hansen (1813-1891; page 304) came from Athens for a permanent residence in Vienna, where he erected the University in 1837-1842 in the Classical style (in 1860 he built there the Academy of Sciences in the style of the Parthenon). There he became the creator of the immense Parliament House (1874-1883), which is built on an entirely symmetrical ground plan 531.5 × 459.3 ft. in a Renaissance style, which by a cheerful and extremely attractive Hellenism, particularly on the porticos of the middle and angle projections, receives an independent stamp. Hansen was also an eclecticist. The Museum of Arms at the Arsenal (completed 1856) and the Greek church on the Fleischmarkt (1858), he treated in a picturesque Byzantine style approximating in details to the Hellenistic series of forms; on the Academy of Art (1872-1876) and the Bourse (1872-1877) he transferred his Hellenism to the Italian high Renaissance.

While Hansen afterwards brought the Classicism into high consideration, Heinrich von Ferstel (1828-1883) represented the Romantic tendency. His Votive church (Fig. 280), erected 1856-1879 for the sin of the attack on the emperor, is indeed the most mature German church building of the Neo-Gothic. Ferstel saw his strength more in the Italian high Renaissance than in Gothic. The buildings of the Austrian Museum for Art and Ind-

Industry (1868-1871) and the University (1874-1884) are each distinguished by a very beautiful arcaded court, and exhibit the Italian high Renaissance in a noble and powerful treatment. (Fig. 281). More severe than Ferstel in acceptance of Gothic, Friedr. Schmidt (1825-1891), came from Wurtemberg, was trained in the workshops of Cologne under Zwirner, and from 1862 established as cathedral architect of S. Stephen in Vienna. In the extremely picturesque parish church at Fünfhaus near Vienna (1867-1875), he erected an octagonal central structure with a great dome and two front towers in Rhenish Gothic. (Fig. 282). His principal work, the City Hall in Vienna (1872-1883) is in its way a model creation, by the splendid design of its ground plan, finely satisfying the requirements of a good administration, and by the Renaissance motives happily combined with Gothic architecture.

The architectural activity of the imperial court was continued in the paths previously sketched by Semper (page 322). When Semper came to Vienna, the ground plan of the K. K. Court Museum had been designed by Carl von Hasenauer (1833-1894), working there besides the masters just mentioned, who had received his training in Brunswick and Vienna, then undertook extended tours through Italy, France, Holland and England, and in Vienna at the beginning of the sixties had made himself conspicuous by some secular buildings, that caused much surprise. A violent contest broke out concerning its plan and architecture, in which Semper was required to make the decision. He subjected Hasenauer's plan to a revision, and with the collaboration of Hasenauer, he prepared a grand general plan, in which the Hofburg theatre should occupy a prominent place. He gave to this the form of plan, which he had projected for the unexecuted Richard Wagner Festival Hall at Munich. Semper was further engaged on the structure of the Court Museum (begun in 1872). The façades (Figs 283) recall the Dresden Gallery of Paintings, but already show a transition to the Italian Barocco style. The Hofburg Theatre was executed in 1880-1886 by Hasenauer alone, since Semper would no longer work together with this rival, who violently opposed him, and had left Vienna in 1876 (page 323). Both in the external architecture as well as in the splendid interior decoration of this theatre

(Fig. 284) was manifested the complete transition to Barocco showiness. Hasenauer doubtless possessed strong decorative talent; but in the grand monumental treatment he remained inferior to the previously mentioned masters. In the most recent years Otto Wagner (born 1841), an architect educated in Vienna and Berlin, stands at the centre of architectural creation in Vienna. But his activity and that of his numerous pupils and adherents belongs substantially to the modern tendency in art, as the principal founder of which, Wagner is to be taken. (Page 366).

Likewise in the Hungarian capital of Budapest, architecture in the 19th century in evident competition with Vienna assumed an unusual advance. Numerous churches and secular buildings were erected and indeed during the first half of this century entirely within the bounds of Classicism. Later the architecture in general took a development similar to that in Vienna. The most prominent representative of the Neo-Renaissance was Nicolaus Ybl (1814-1891), educated in Vienna, who erected the cathedral of S. Stephen, begun (after 1868) by Joseph Hild (died 1764), and the Opera House (1879-1884) in the most mature and luxuriant style of the Italian high Renaissance. On the more important of later works, the Parliament House erected (after 1882) in colossal dimensions by Emanuel Steindl (Fig. 285), the architecture of Budapest returned to mediaeval forms.

2. France.

The change from the Classicistic bounds retained by the Empire style occurred at the beginning of the thirties. Already Percier, although he recognized Grecian architecture as a perfected model, had recommended for France the architectural forms of the Italian Renaissance as better adapted to the climate and the requirements of the country. But also the native art of the past found an increasing interest. By Jacques Felix Duban (1797-1870) in rebuilding the Ecole de Beaux Arts, remains from the French late Gothic and Renaissance were utilized with great reverence and refined taste. * The chateau at Blois (volume 2, pages 156, 264) and the Gallery of Apollo in the Louvre (page 93) owe to him their intelligent restoration. The gifted Henri Labrousse (1801-1875), pupil of H. Lebas (page

253) held himself entirely free from the classical restraint. He devoted particular attention to iron construction. At his Library of S. Genevieve (1840-1850), he covered the great reading room in a manner forming a model for the purpose, by a system of low domes resting on slender cast iron columns. Each dome has at its vertex a great glazed circular opening as a skylight. The facade bears the character of an early Italian Renaissance. The ground story has only a simple round-arched doorway and small round-arched windows; above the belt cornice, ornamented by garlands, the upper story rises with a subdivision by a continuous series of great round-arched windows, walled up in the lower half, whose intermediate piers like wall strips stand on the belt cornice. Likewise the new reading hall of the National Library was rebuilt in 1850-1855, and is constructed in a similar manner. Joseph Duc (1802-1878), a pupil of Percier, was rather inclined to a Classicist-Grecian severity. His rebuilding of the Palace of Justice at Paris, begun in 1859 (Fig. 286), was partly destroyed by fire in the revolution of 1871, but was again restored later. To the same tendency belongs Hittorf's last great work, the Northern Railway station at Paris (1863), which by the grand iron construction over the hall 229.7 ft. wide, and by the facade opening in colossal round arches, as well as by its covering by doubled Ionic pilasters with a connecting pediment of gentle rise, produces almost a modern impression.

** The view from the court of the chateau of Anet reproduced in Fig. 303 of volume 2 (page 261) was transported by Duban to Paris.*

To these works of the early Neo-Renaissance the adherents of the Neo-Romantic tendency opposed the Gothic. The first of their larger buildings was the church of S. Clotilde in Paris, (1846-1857), arranged as a basilica with two pointed front towers, that Franz Christian Gau (1790-1853) from Cologne commenced in an early Gothic, yet timid treatment, and Theodore Ballu (1817-1885) completed in already more mature forms. The Neo-Gothic received a deeper tendency in the works of the important Jean Baptiste Lassus (1807-1857), who was a pupil of E. Labrousse, but then turned from the Renaissance and became a passionate advocate of the Gothic. The highly gifted Viollet-

le-Duc (1814-1879) joined him, just as a distinguished learned man, who investigated the middle ages in an exact and scientific method, as well as a talented architect of unusual creative powers. The magnificent restoration of the S. Chapelle (after 1838) and of Notre Dame cathedral (after 1842) in Paris, (volume 2, pages 100, 102), for which Lassus had previously prepared plans, are his work. Of his numerous other works of restoration, that of the castle of Pierrefonds (volume 2, page 156) stands in the first rank. The very harmonious court of the castle (Fig. 287) shows, how deeply the master had penetrated into the spirit of the middle ages. He prized the originality and stylistic correctness of the Gothic, but demanded particularly not a mere imitation, but a thorough grasp and a basal working out of the architectural problems, with an independent employment of historical forms. By his numerous publications, which form a very valuable basis for the study of the Gothic church and secular architecture, even if we can no longer accept his decisions on all points, Viollet-le-Duc has created the greatest and most enduring influence. Leon Vaudoyer (1803-1872) joined Lassus and Viollet-le-Duc as a representative of the mediaeval treatment of forms. He had received a Classicistic training, but had then passed over to the Gothic. On his cathedral at Marseilles (after 1855), a three aisled cross plan with semicircular choir, outer aisle and circle of chapels, a great dome over the crossing, two small domes over the cross arms, and two front towers above a portico, he indeed resorted to southern French Romanesque forms with the use of colored materials, that recalls the buildings of the Pisan school (volume 2, pages 15, 50). In the second half of the 19th century and under the government of Napoleon III, who endeavored by zealous fostering of commerce and industry, sciences and arts, to strengthen and increase the esteem for the crown, a series of grand architectural problems fell to the French architects. By their excellent training in both construction and the treatment of forms, they acquired a position dominating almost the entire architecture of the West. The introduction of iron into monumental architecture made greater advances. Victor Baltard (1805-1847) erected the colossal Central Market Halls in Paris (1852-1874), calculated for 3000

sale stalls, a glass palace constructed of iron and glass above a brick base, a model for the European continent. * In a novel and bold manner he then introduced the iron construction with an additional prominence in his fine church of S. Augustine in Paris (1860-1868). On the site given by two diverging streets, widening from the facade to the choir, he arranged in a very happy manner a basilican nave with side chapels of ever increasing depth, and in addition thereto a great central area on an irregular octagon with three side apses and chapels. The construction followed as an iron framework in combination with stone. The vertical supports are executed in cast iron, the vaults and ribs, as well as the pendentives, the dome and the lantern, are of wrought iron. For the ornamentation Baltard borrowed the decorative forms of the stone architecture of the early Renaissance. Thus he was not so far advanced, as to give to iron independent forms developed from its metallic character.

** A crystal palace had already been built in London for the World's Exhibition of 1851.*

As a church architect, the previously mentioned Theodore Ballu (page 337) enjoyed high esteem at that time. His principal work, S. Trinite at Paris (1861-1867) in the two story facade with middle tower rising above three round-arched portals, exhibits an early Renaissance, which in the window treatment and triforium adopted many motives from the Romanesque style, but also in the numerous breaks in the cornices and the niche architecture some of the late Renaissance. Ballu designed and had charge, together with Pierre Joseph Deperthes (1833-1898), of the rebuilding of the City Hall in Paris (volume 2, page 258), where the ancient plan and structure in general was retained. The very rich external and internal architecture acquired the character of the developed early French Renaissance.

The architecture of France in the second empire is indeed most strikingly characterized by the Grand Opera in Paris. To obtain designs for a new opera house, a competition was ordered in 1860. The prize was won by a pupil of Lebas (page 253), Charles Garnier (1825-1898). In his design he had not only expressed the purpose of the building by indicating rooms for a

access, the audience and the stage rooms, even externally in a happy manner, but he had also created an architecture intermediate between the Italian high Renaissance and the style of Louis XIV, which was received by the most lively approval by the deciding committee. Already the facade had an extremely showy effect. It is arranged with seven axes, the two outer ones being treated as projections. Above the ground story opening in round-arched doorways is arranged a loggia occupying the entire width, with coupled columns after the style of the Venetian high Renaissance, a massive crowning cornice, and a high attic, indeed not fortunate in its proportions, over richly decorated by ornamental and figure ornamental work. The polychrome treatment by the use of red Jura stone beside white and Swedish marble, and also partly by gold, even heightens the truly unexpected effect. In the interior, particularly the stairway (Fig. 288) and the foyer are showy interiors almost unequalled, which gave to the French court and the distinguished Paris world assembled there, a striking background. The completion of the building externally followed in 1867, in the interior in 1875. On the Theatre and the Casino at Monte Carlo, Garnier produced a still luxuriant Barocco, but one restrained within fixed bounds.

The most important Paris church building of this time is the Expiatory church of Sacre Coeur on Montmartre, on the basis of a competition, which fell to the architect Paul Abadie (1812-1884), who worked on Notre Dame under Viollet-le-Duc, after 1874 had independent charge of its restoration, and had built in southern France (Angouleme, Bordeaux) some Neo-Romanesque churches and city halls. The ground plan has the form of a Greek cross with a great choir addition, in accordance with the cathedral system, and a deep porch. Over the crossing rises a dome 262.5 ft. high; above the chapels in the angles of the cross arms rise four smaller subordinate domes. In the plan and the architectural treatment, the southern France Romanesque style here celebrates a magnificent resurrection, as it had been particularly developed in the domed churches of Aquitaine. (Volume 2, pages 13, 44). Suggestions from the Romanesque style may also be recognized in Palace Trocadero, erected for the World's Exhibition of 1878 by Gabriel Davoud (1823-1881).

and Jules Desire Bourdais (born 1835). The principal building projects between two square towers in a great semicircle with colossal arched windows between buttresses, toward the bank of the Seine, surrounded by an open two-story round-arched loggia. Freely developed from the requirements with an assured feeling for the effect of the masses, the design is executed in a plain combination of bricks and cut stone, and it should still be taken as a model for similar structures. Davioud had later introduced the Barocco style of Louis XIV on his frequently imitated Theatre du Chatelet on Place Chatelet in Paris. Otherwise the architecture of the republic remained in an enterprising spirit, evidently behind that of the preceding second empire. Among the later architects Leon Ginain (1828-1898), a pupil of Labrouste, and Paul Sedille (1836-1900) made a name, Ginain with the church of Notre Dame des Champs and the rich palace (Museum) of the duchess of Galliera; Sedille with his showy structures for the World's Exhibitions of 1878 and 1889, and the great Magasin du Printemps (department store) (1881), on which iron construction enters into a fortunate combination with stone. An entirely novel type of structure was erected by Gustave Eiffel (born 1843) in the well known Eiffel Tower for the World's Exhibition of 1889, 984.3 ft. high and entirely constructed of wrought iron. This colossal iron framework merits our recognition on account of its originality, consistent form and construction, and also a certain beauty is peculiar to it, yet a grand monumental effect can scarcely be attributed to it. Yet the Eiffel tower gave a powerful impulse to the endeavor for a new and "rational" style, independent of historical forms. But the leadership in the movement with this aim, and already powerfully aroused at the beginning of the nineties and extending over the entire West, was then taken by German architecture.

3. England.

The freedom of English architecture from the fetters of Hellenistic Neo-Classicism was secured in the second quarter of the 19th century. Indeed a series of important architects remained faithful to the antique ideal of art; they sought by suitable transformations and greater adaptation to modern architectural requirements, to retain for this its previous impor-

importance. But the Renaissance introduced by them could not advance against the strong mediæval current. The greater harmony of the Gothic architectural monuments with their natural surroundings, their self-evident structural principles, opposition to the entirely decayed Classicism, and not least the German nature expressed in Gothic art, gave to its adherents a successful power of conviction and a great superiority over the Renaissance.

The Neo-Gothic required a longer period of development to reach its climax. Men began unconsciously with the most striking motives, according to a well known general principle repeated in our previous statements, which were offered by the latest Gothic of the Perpendicular style (volume 2, pages 111, 113); then in the evolution they went further back to the early Gothic, and from this slowly forward again until the Perpendicular style was reached, which as in the Elisabethan and Jacobean time (volume 2, page 327) was finally mixed with the forms of the Renaissance. In the first stage of the Neo-Gothic style frequently resulted a direct of still Classicistic structural framework in a Gothic exterior. That also entire mediæval plans were imitated need not cause surprise. * Gradually under the influence of several important literary publications on mediæval architecture was built up a deeper understanding of the Gothic architectural organism. Among these publications those of Augustus Pugin (1762-1832) and of his son Augustus Welby Pugin (1813-1852) take the most important place. The younger Pugin (page 312) became the actual path-breaker of the English Neo-Gothic. He commended the Gothic style as not only the sole one available for church architecture, but also that most suitable and dignified for secular architecture.

** James Wyatt (1748-1818) erected about 1807 in Salisbury the chateau of Fonthill Abbey in the form of the plan of a Gothic monastery. It thereby found such approval, that a great number of noblemen's seats were built in the same style.*

After the middle of the 19th century the aims and the style tendencies became clarified. The Romantic movement had previously introduced a mighty religious exaltation as a reaction against the rationalism of the preceding century, representing reason in religious opinions. The consequence thereof was a

close approximation to Catholicism, which even led to the adoption of a solemn altar service and of processions. * Under the high church feeling of the time, church architecture made an unusual advance. But also to secular architecture was devoted public interest in increased measure, after the grandly intellectual John Ruskin (1819-1900) in his writings on the formative arts, with unsurpassed eloquence had treated the meaning of architecture, its nature and its aims. Ruskin unlike Pugin, did not see in the English late Gothic the only saving art; he was also enthusiastic for French and Italian models, particularly for the rich splendor of the marble incrustations and mosaics of Venetian buildings, indeed chiefly on account of their poetic harmony and picturesque charms, for which Ruskin first spoke. He was a zealous champion of all hand wrought and personally treated art, free from transfers like patterns. Thus Ruskin on the one hand opened to English architects views of the architecture of foreign lands, whose forms brought enrichment to them, and participated in their problems, even in competitions; on the other hand he aroused in them a particular esteem for genuineness of materials, solidity and visibility of the construction, and the correctness, simplicity and naturalness of the architectural and ornamental treatment.

** The influential younger Pugin passed over to Catholicism in his religious enthusiasm.*

Favored by the economical improvement occurring after the sixties, English architecture now took on a free development, independent from foreign countries. Church architecture for the reasons previously mentioned adhered to the altar service and the form of plan of the mediaeval works intended for solemn processions. For the small and often truly picturesque parish churches, the buildings designed by Pugin became typical. He preferred the three or two aisled basilican plan without galleries, with a deep rectangular choir, visible framework of the roof, a front tower on the longitudinal axis, and with entrance by a side porch. The Protestants were disinclined to the ritual solemnity and firmly adhered to their strict conceptions -- these were chiefly the sects of Calvinistic Presbyterians, Congregationalists (Independents), Baptists and Methodists-- also expressed their opposition in their religious

buildings. They erected houses for preaching with exclusive regard to the greatest possible number of seats in an arrangement, such that from each seat one could properly see and hear the preacher. Around the great audience rooms were grouped other rooms for use by the community; a smaller assembly hall, perhaps also a school room, a reading room, library, smaller rooms for the clergy and the administration, and in more extended plans even a gymnasium, concert hall, conversation hall and the like. The possibility of connecting rooms by the installation of sliding partitions was from the first taken into consideration. For the construction was chiefly employed Gothic, but also Renaissance, occasionally also Barocco, and not seldom purely structural forms.

In secular architecture English architecture differs from that of the continent substantially only by the freer handling of historical forms of styles. Innovations, such as the introduction of iron as a structural material might have caused, changed the structural framework but little. But these appeared so much the more in the great city business structures. This entirely freed itself from tradition and constructed the walls enclosing the rooms and their openings exclusively according to the requirements of the business. (Figs. 292, 349). English architecture preceded that of the continent in this. Still more was this the case in house architecture. The expressed domestic sense of the Englishman, who even in modest conditions strives to own his own home, the generally great prosperity of the citizen class, and the enjoyment developed through many generations, of a certain pure domestic comfort has led here for centuries to a high domestic culture. This indeed in the residences of the class of owners, during the supremacy of Palladianism and of Neo-Classicism, caused many sacrifices in the arrangement of the ground plan and in the structure for the benefit of the external architectural treatment. But in the architecture of the citizens, which was less affected by the changes in the grand architecture, these were expressed the more clearly. To them was devoted the attention of the house architects, after the requirement to build in "full style" in the former classicistic sense was set aside, and men had broken out a path for an appropriate, genuine and comfort-

comfortable, and thus a "habitable" mode of building. The advantages of the plain citizen's houses were then recognized, that had remained in great number, particularly from the reign of queen Anne (1702-1714). * In their picturesque arrangement in the green of the garden, in its structure developed only with regard to the requirements of space and light, with the cosy and inviting bay windows between the red brick walls, the connected rows of windows, the plain white window enclosures, the shadows of the projections of the roof, and the massive chimneys, these arouse the highest admiration. In reference to them the English architects after 1860 developed the modern type of the house for a single family. They gave it a very free arrangement of the ground plan. On the very modest exterior is strongly emphasized the rural character in the structural material and the treatment of details. The charm of these buildings substantially consists in, that in their entire appearance they express the suitability, comfort and truth of the internal arrangement. (Fig. 289). Likewise in the interior decoration the reform aimed at simplicity, propriety, genuine materials and workmanship, finally under the lead of the celebrated William Morris (1834-1896) extended to all art industry. By him English architecture acquired a determining influence on the entire domestic architecture of the continent. Indeed on the buildings also erected by the extensive contractors in English cities for rental, a lack of taste appeared just as on the continent. But the tasteful general appearance presented by the architecture of England in the second half of the 19th century was but immaterially influenced.

** To this citizens' style of architecture has been given the name of Queen Anne style, but it must not be overlooked here, that the queen herself caused all the larger public buildings to be erected in the Palladian style. (Page 201).*

The greatest English architect in the first half of the 19th century, Sir Charles Barry (1795-1860), was an artist nature allied in spirit to the German master Semper by his power in monumental treatment. Already in the thirties he left the monotonous Hellenism for the introduction of the Italian high Renaissance. His Traveler's Club House erected in 1830-1832, on which is visible the influence of palace Pandolphini, and

the facade of the Reform Club House (1837), influenced by the palace Farnese in Rome, are the earliest London buildings of the Neo-Renaissance. Its first representative also became the greatest Gothicismist of his time. It was in great part to be ascribed to the influence of Pugin, that Barry's most important creation, the famous Parliament House in London (completed 1852) and erected on the bank of the Thames, was built in the Gothic style. Barry proved himself a master in this, who dominated the prescribed mediaeval series of forms with astonishing certainty, but also in free creation sought new forms of treatment. The design arranged in a clear ground plan in colossal dimensions is grouped unusually well, in general with a grand and monumental effect, (Fig. 290), and in details possesses the highest artistic charm (Fig. 291), in spite of a certain monotony produced by the strict employment of the perpendicular style with continual repetition of tracery and of the same form of windows. Equally stately in the smallest details is the effect of the interior executed in the same style, even if in regard to symmetry, the often excessively large halls and rooms partly suffer under an overloading with architectural and decorative forms. W. Pugin also took part in the treatment. His thorough acquaintance with the mediaeval conception of art and world of form, and the depth of his invention are expressed in a purity of style, that accurately produces the impression of genuineness.

A freer tendency, particularly drawing from French Gothic sources, was followed by George Edmund Street (1824-1881), Barry's pupil, on his churches and his most important secular building, the Law Courts in London (1867-1882), on which he made great sacrifices to the picturesque effect of certain motives, particularly the small round angle turrets, the triforiums and the grouped windows. Infinitely more severely proceeded Sir George Gilbert Scott (1811-1878), England's most important early Gothicismist and church architect of the 19th century. He was the restorer of the cathedrals at Ely, Hereford, Exeter, Lichfield, and the Westminster Abbey church in London (Volume 2), and the builder of the great cathedral in Edinburgh, a three aisled cross basilica, as well as of the church of

S. John at Torquay, on which under Ruskin's influence he combined brick with marble after the Italian style. In the general competition for the rebuilding of the church of S. Nicolai in Hamburg, burned in 1842, he obtained the victory; this church was erected in 1846-1863 after his plans. William Butterfield (1814-1900) gave a variegated animation of the surfaces by colored tiles and stone slabs to his buildings, among which the church of All Saints in Margaret St., London (1849-1859), first erected strictly in accordance with high church requirements, and Keble College at Oxford, were much esteemed. John L. Pearson (1816-1897) sought rather to produce an earnest church harmony and antique effect by simplicity and purity of style. He employed brickwork without stucco and introduced vaulting instead of the previously visible framework of the roof, or of the ceiling sheathed in tunnel form. His most important works are Trinity church at Westminster (after 1850), entirely following old English models, the great five aisled church of S. Augustine in Kilburn in London (1871-1880) and the grand cathedral at Truro begun in 1880.

Since the eighties the more important church architects passed from early Gothic to high Gothic and the Perpendicular style. At the same time became apparent an increasing attention to the audience room proper. John Sedding (1837-1892) gave a wide aisle to the Trinity church in Sloane St, and on the contrary arranged the side aisles as merely narrow corridors. * He proceeded with greater freedom in the historical forms. His gifted pupil H. Wilson followed him in the way pointed out, but went farther in the capricious employment of historical forms. His picturesque church of S. Mark at Brithdir may also be regarded as a modern work. An exceptional position in English church architecture was taken by Westminster cathedral (R.C.) in London, erected since 1895 by John F. Bentley (1839-1902) for Catholicism, elevated to new power. It was erected in brick masonry as a combination of the old Basilica of Constantine with the central building of S. Sophia (volume 1, pages 139, 154), in Early Christian-Byzantine forms, but which were personally conceived and worked over. Both the interior, magnificently decorated by the rich marble incrustations and mosaics, and the external view dominated by a square tower wi-

282.2 ft. high, produce an earnest, elevated and solemn impression. The Gothic style passes in England as specifically Protestant; therefore Catholicism preferably returns to the Renaissance in its churches. Among the churches of the sects (page 344), the Congregational church in Duke St. in London, built by Alfred Waterhouse (1830-1905) takes a prominent place. It is a great building for the congregation with an audience room like a concert hall and a massive principal tower in Romanesque forms. Waterhouse also appeared in secular architecture with important works. The Town Hall at Manchester (after 1869) with a square principal tower on the middle axis of the facade and the grand Natural History Museum in London (1873-1880), with facades faced with terra cotta slabs and adorned by charming terra cotta ornaments, both kept in the late Romanesque style, permit him to be recognized as an important and monumentally designing internal artist. The Union church in Brighton by John W. Simpson in the latest time is a central structure with square middle room, adjoined by three apses with galleries and half domes. The external architecture is clothed entirely in the forms of a rich Barocco style in the mean between the Italian and the French conceptions. With its mighty dome and the two towers of the facade it produces an imposing impression.

* Compare on page 324 the form of the plan of the church of S. Thomas in Berlin.

324 In opposition to the Neo-romantic, that almost entirely dominated the church architecture, the Italian Renaissance introduced by Sir Charles Barry maintained an assured position in secular architecture. After Barry the much employed Sir James Pennethorne (1801-1871) passes for its chief representative. The University in London, built after his design and completed in 1869 by Tite, in spite of its rich architectural expedients, in general only bears the stamp of a weak, characterless, and frequently inorganic combination of Italian Renaissance motives. More tasteful is Th. E. Colcutt (born 1840), who again turned to the English Renaissance in his works, among which the Imperial Institute in London (1887-1893) is the most important, but also exhibits a certain inclination to rich forms and ornamental decoration.

A great and freely creating impulse arose in English architecture in Richard Norman Shaw (born 1831). He began with Gothic, but soon took up Renaissance and even Barocco motives, which he employed with the highest artistic freedom. He exercised an unusually fertile activity, first in church architecture, but then exclusively in secular architecture, which he led into new paths. His ground plans are regarded as models. In the architectural treatment he showed himself an adherent of a simple citizen's architectural style, controlled first by considerations of suitability. He brought brickwork again into use. By its preparation with the chisel and carving tool in the mode already practised by Islam (volume 1, page 208), he produced charming ornamental decorations. By the New Zealand Chambers in Leadenhall St. in London begun in 1872, he gave to the modern business building an architectural form suitable for the time. To introduce abundant light into the rooms, the walls are there resolved into piers, between which the windows project like bay windows. (Fig. 292). Shaw allowed the piers to intersect the great cavetto of the roof cornice without further mediation. In this manner he produced a monumental and picturesque effect. The Head Police Station in London, Shaw kept in a Dutch-English Renaissance. He disposed with entire freedom of the small houses for a single family, of which the most famous are those of the Villa Colony of Bedford Park near London. In a similar tendency labored Ernest George & Peto on their houses in Collingham Gardens in London (Fig. 293), erected in 1887, where indeed historical style forms were employed in more abundant measure. The public buildings, which naturally afforded less opportunity for novel treatment, also in the last quarter of the 19th century still manifest a closer adherence to traditions. The Courts of Justice at Birmingham, erected by Aston Webb and Ingress Bell in 1887-1891, is a dignified brick structure with rich terra cotta ornament in the forms of the early English Renaissance. A somewhat more mature stage of the early Renaissance is represented by Henry T. Hare in his City Hall at Oxford, attractive by its personally freer conception. On the Britannia Royal Naval College in Dartmouth erected by Webb, and the Royal College of Science in London, as well as on the City Halls at Sheffield and Batters-

Battersea, which have the architect E. Mountford as their creator, the English high and late Renaissance appear with a Barocco strain. Entirely new, and entirely freed from all conventionality, means of architectural expression were employed by O. Harrison Townsend in his Gallery of Paintings at Whitechapel in London, and the Horniman Museum there. He belongs to the path-breakers of the modern tendency in architecture.

4. Italy and Spain.

In ITALY after a long period of repose, architecture made an unusual advance after the erection of the kingdom. (1861). The energy of the young kingdom first of all expressed itself in the energetic spirit of the larger cities. These competed with each other in the remodeling and beautifying of their plans and the erection of impressive buildings. Yet the art of Italy, that in the period of the Renaissance and the Barocco styles had exerted a determining influence upon all European art, never again in the 19 th century attained a leading importance. It remained inferior to those of Germany, France and England, and frequently adopted suggestions from those countries. As there, so in Italy the Neo-Classicism was replaced by Eclecticism.

The centre of gravity of the architectural activity occurred in north Italy. In Milan Carlo Maciacchini (1818-1891) designed the monumental Camposanto (after 1865) with nobly treated buildings and porticos in the forms of the early Renaissance of upper Italy. At the same time Giuseppe Mengoni (1820-1877) began the grand gallery of Victor Emanuel (1865-1877) as an intersection of two stately streets 47.6 ft. wide and respectively 639.7 and 344.5 ft. long. (Fig. 294). In the architecture of the facade resembling a triumphal arch and the internal facades, the forms of the Italian early and high Renaissance are employed beside each other. This gallery is the most important secular building of modern Italy. Giuseppe Balzaretti (1801-1874) selected for the Savings Bank (Cassa di Risparmio) built by him in 1871 the rusticated architecture of the Florentine Renaissance palaces Strozzi and Riccardi (volume 2, Figs. 209, 243); Giacomo Franco for the church at Lonigo (1878) the basilican style of the early mediaeval churches of the 11 th

century, permeated by northern Romanesque motives. The two celebrated writers on art, Camillo Boito (born 1836) and Luca Beltrami (born 1855), likewise appeared with notable architectural creations, the former among others with the principally Venetian Gothic Musicians' Home, the latter chiefly with the stately building of the well known journal *Corriere della Sera*, subdivided by broad Tuscan pilasters between the great windows. To the recent tendency belongs the palace Castiglione erected by Giuseppe Somarugi, which is manifestly influenced by the Wagner school in Vienna.

For Florence the restoration and completion of the cathedral (volume 2, page 136) occupied the chief interest of the architects. Emilio de Fabris (1808-1883) erected the newly constructed Gothic marble facade in harmony with the campanile beside it in a masterly way. Thereby he found so much approval, that his bust was placed in the cathedral beside that of the first cathedral architect, Arnolfo di Cambio (volume 2, page 136). The Neo-Renaissance is represented by the charming Villa Lazzari of Giuseppe Boccini (1840-1901) in a stately classical example, combining the art style of Raphael with that of Palladio.

Rome first introduced a rich architectural activity in the eighties. This was dominated by the high and late Renaissance. As the most prominent work is regarded the Palace of Justice by Guglielmo Calderini (born 1845), erected after 1888 in a predominating Palladian style on a rectangle 557.8 x 465.7 ft., and further the Art Exhibition Building by Pio Piacentini (born 1846), strongly influenced by the Fountain of Trevi, and the dignified Bank d'Italia by Gaetano Koch, subdivided by three-quarter columns in both upper stories. But the great National Monument for Victor Emanuel in Rome, designed by count Giuseppe Sacconi (1855-1903), and only erected in the latest time, returns to a severe Classicism in its Corinthian porticos enthroned above a massive substructure.

Naples received through Ernesto di Mauro its Gallery Umberto (1887-1891), which however does not equal in effect its model, the Milanese Gallery. On the other hand the new University by Pietro Paolo Guaglia (died 1898) is a monumental work in a modern late Renaissance style. In Palermo Giov. Batt. Filippo

Bariles (1825-1891) erected in the Theatre Massimo, which was completed by his son Ernesto Basiles (1897), one of the best arranged, largest and most magnificent theatres of the world. In the international competition for obtaining plans for this building, Semper also participated as the judge of awards.

In SPAIN the Neo-Romantic style set in with the restoration of mediæval churches. In the church of Nuestra Señora de Al-ocha at Madrid, which was erected in place of the church standing there and torn down (after 1890), appeared a Neo-Romantic structure. The restoration of the Alhambra (volume 1, page 2219) also gave an impulse to the adoption of the Moorish style. The amphitheatre for bull-fights at Madrid, erected in 1873-1874 by Emilio Rodríguez Ayuso (born 1845) and Alvarez Capras, is in general kept within Moorish forms. Yet in general a late Renaissance predominates, already standing on the stage of transition to the Barocco style. It is represented by a splendid example in the Bank Hispano-Americano Building at Madrid, erected in 1884-1891 by Eduardo de Adaro (died 1906) in connection with Severiano de la Lastra. On the contrary the imposing Bourse at Madrid, that had the architect Enrique Maria Repullies as its creator, with hexastyle Corinthian portico and pediment, in its entire treatment appears as a belated production of Neo-Classistic architecture.

5. Netherlands and Scandinavia.

After BELGIUM had separated from Holland and had been elevated to be an independent state (1830), under the wise government of its king Leopold I (1831-1865), to whom was largely due the intellectual and material development of the country, it entered on a splendid period, that had as a result an extremely rich and grand architectural activity. This at first continued in close adherence to French art, as in the Classicist epoch, and particularly as far as the Romantic tendency appeared. In the course of the seventies, the Belgian architects sought an art corresponding to their people by a return to the native Renaissance, and about the end of the century and earlier than in other lands, they passed over to entire freedom from all historical styles.

The first work of the Neo-Romantic style was executed by T. Fr. Suys the Elder (page 300), known to us as a classicist, in

the church of S. George at Antwerp (1848-1853), conceived in a still timid Gothic style. As an infinitely more mature creation appears the spacious and picturesque central building of the church of S. Maria at Brüssels-Schaerbeek, which was erected in 1844-1850 after the plans of Louis Overstraeten (died 1849). The architecture of the lower parts of the building still remains in the Romanesque forms, but chiefly for structural reasons passes into an early Gothic in the dome. (Fig. 295). Joseph Louis Schaede (1818-1894) transferred the Gothic to secular architecture on the Bourse at Antwerp, erected anew by him in 1868-1872, whose vast hall he furnished with an iron roof framework of wide span, and on the rebuilding of the railway station at Bruges, undertaken in 1877. In adherence to Viollet-le-Duc was developed a school of architecture in Belgium, which with refined understanding executed the restoration of mediaeval buildings, also erected those of the picturesque marketplace in Brussels, and a great number of church and secular structures scattered over the entire country. Even the chief Belgian masters of this time, Poelaert and Beyeart (see below) were occasionally employed as Gothicists, particularly in church architecture.

But on the whole in Belgian architecture, the Neo-Romantic remained behind the Renaissance in influence and importance in the history of art. Suys the Elder had introduced the Renaissance with his still rather Classicistic church of S. Joseph at Brussels (about 1849). On the new Bourse at Brussels (Fig. 296) erected by his son Leon Suys (1824-1887) in the years 1868-1875, the French high Renaissance appears in sharp development in evident competition with Garnier's Opera House. The principal work of modern Belgian architecture is the Palace of Justice at Brussels (1866-1883) by Joseph Poelaert (1816-1879). This building was erected on a ground area of 590.6 × 557.3 ft. at a cost of ten million dollars, and it exhibits the forms of an extremely massive Roman or late Renaissance, in which appear Egyptian, Persian, and even Assyrian motives in the terraced ascending architectural masses. In spite of the not completely organic architecture, the general appearance is overpoweringly grand. In the interior the statuary of the vestibule (Fig. 297) and the great waiting hall, whose dome rises to a

height of 318.3 ft., are architecturally the most important rooms. In Antwerp M. Buns built the Flemish theatre in 1869-1872 in a noble French-Flemish high Renaissance; Louis Baeckelman the Palace of Justice (1871-1875) in the style of the early French Barocco architecture. The gifted and learned Henri Reyaert (1823-1894) erected the National Bank in Brussels in a style still based on the French high Renaissance, but also employing Barocco and Louis XVI motives, then passing into the national Flemish Renaissance, in which he built the Belgian Bank on the Central boulevard at Brussels and the railway station at Tournay. In this tendency there followed him the much employed J. J. von Ysendyck (1835-1911), also known as a writer on art by his book on old Belgian buildings, in whose picturesque city halls of Schaerbeek and of Anderlecht, the native Renaissance attained new life. The leading Belgian master of the most recent time, Henri van de Velde (born 1863, now Director of the School of Art Industries at Weimar), and Victor Horta already belong to the series of modern artists.

HOLLAND again adopted about 1850 its ancient native brick architecture with bands and members of cut stone, both on a mediaeval basis as well as in the forms of the Renaissance of the 16th and 17th centuries. The chief representative of Neo-Romantic tendency was Peter Cuyper (born 1827). He was the builder of a great number of churches, among them being the Herz Jesus church in Amsterdam and S. Jacobus' church at the Hague, that are both executed in the early Gothic style. He obtained high favor by his most important secular building, the Royal Museum in Amsterdam (1877-1885), in whose imposing external architecture the late Romanesque forms are permeated by Renaissance motives. (Fig. 298). The same style was given by Cuypers to the main railway station in Amsterdam, completed in 1889. For the revival of the national Renaissance labored Gugel, influential through his position as professor at the Polytechnic school at Delft. His University at Utrecht (completed 1894) is a picturesque work in his early style. Somewhat more personally concerned and more animated by Gothic forms of arches appears the same on the charming railway station at Groningen, built by J. Gosschalk. The University there is a work of the Royal architect Vryman and adheres more closely to the

native art of the 17th century.

Likewise in Holland at an early date prevailed the pressure toward an entirely free treatment completely independent from traditions. The new Protestant church in the Hague built by J. Verneul, already in the subdivision of the masses, in the aim for effect of the surfaces, and in the architectural treatment already passes over to the modern style. Entirely in this course worked Hendrick Petrus Berlage (born 1856), whose works, like the earnest brick architecture of the New Bourse in Amsterdam, in the general effect and treatment bear a character visible at the first glance, still reflecting the native Romanesque.

357 In DENMARK, where Classicism had struck such deep roots and had already exhibited such rich fruits (page 302), the Neo-Romantic movement could but slowly find a firm footing. Yet two larger Romanesque church buildings are to be mentioned, the church at Holbak by Christian Hansen (page 303) and the church of Jesus at Copenhagen by J. Vilhelm Dahlerup (born 1836). Likewise in secular architecture the Neo-romantic is represented by the University Library in Copenhagen by Joh. Dan. Herholdt (born 1818), built in Lombard-Romanesque forms with the addition of iron construction. Otherwise the Renaissance predominates in the field. Dahlerup with Ove Petersen (born 1830) erected the Royal theatre in Copenhagen (1872-1874) in the Palladian style. Also the Ny Carlsberg Glyptothek in Copenhagen (1891-1897), designed in 1886 by the first alone, with finely designed internal decoration bearing a Palladian stamp. But Martin Nyrop in his new city hall at Copenhagen (1892-1903; Fig. 299) returned to the native brick architecture influenced by the Netherlandish-German Renaissance (volume 2, page 317), to which he gave new life by original motives handled in the modern manner.

NORWAY received the first building of the Neo-Romantic tendency in the church of the Trinity at Christiania. It was erected in 1853-1858 after the design of the Hamburg architect A. de Chateauneuf as a Gothic central building on an octagon with four short cross arms and a dome. More closely to the national style of architecture adheres E. Norgreen's church at Bragernäs-Drammen (1863-1871), a three aisled basilican structure

with choir, internal wooden supports, horizontal wooden ceiling and external stone construction in a Gothic recalling the German Hanoverian school. The heavy church of S. Johann at Christiana erected by George Bull in 1873 expresses a north German basis. The Renaissance was introduced by the German architect Heinrich Ernst Schirmer in the Art Museum in Christiana built in 1879-1885. Henrik Bull created the National theatre there (completed 1899) in a peculiar and purely personal expression of form, not happy in all points. The endeavors of the younger Norwegian architects to bring into honor again the wooden style of architecture, so well adapted to the climate, are to be designated as very pleasing. H. Munthe gave a magnificent example of this, worthy of imitation, in the native Holmenkollen hotel near Christiana.

SWEDEN received by the National Museum at Stockholm built by F. A. Stüler (page 285) its first architectural monument of the Neo-Renaissance, recalling rich Venetian models. After him a series of Swedish architects worked in a purely eclectic manner, not without a certain endeavor to cause recognition of a personal estimation of historical forms. Emil Langlet (1824-1893) became known to a wide circle by the erection of a great number of entirely central churches arranged according to the requirements of Protestant worship. Isak Gustav Olsson (born 1858) was the creator of important residences, erected in different historical styles, among which may be mentioned the palace of count Rosen in the Barocco style (1893), and the palace of count Hallwyl (1899), approaching in the detail forms to a Venetian late Gothic, both in Stockholm. Carl Möller erected the stately church of S. Johann there as an early Gothic cross basilica with high facade tower. The principal work of Swedish architecture in the second half of the 19th century is the group of buildings of the Legislative palace and the Reichs' Bank, built near the Royal palace and dominated by a great square dome (about 1900). It was executed by Aron Johansson in a showy and very luxuriant French late Renaissance. Erik Lallierstedt, the creator of the church of S. Peter at Stockholm, entirely differing from the conventional form, and Ferdinand Bobor (born 1860), the builder of the city electric station there, which by its novel treatment and particularly by its

mighty arched portal arouses attention, are the Swedish path-breakers for modern art.

6. Eastern Europe, America and the Colonies.

The great movement proceeding from western Europe with the aim of reviving the architecture of the middle ages and of the Renaissance extended its waves also beyond the eastern frontiers of Germany and of Austria. In the western provinces of Russia, principally dependent on German intellectual life, in Poland, the Baltic provinces and in Finland, architecture took a development similar to that in Germany. The Neo-Classicism after the middle of the 19th century was followed by the Neo-Romantic and Neo-Renaissance.

In Poland, Cracow formed the centre of the art life. There Feliks Ksiezarski (1820-1884) erected the university in a tasteless Gothic; Franz Macynski the Art palace in freely selected forms of the high and late Renaissance. In Riga originated the Gertrude church (1867), the Catholic Franziskus church (1892), and a great number of secular buildings in the Neo-Gothic style, the Bourse built in 1855 after the designs of Ha von Bosse in Venetian, and palace Ritterhaus (1868) in Florentine Renaissance. In Helsingfors the Renaissance is represented by palace Ritterhaus (1858), the Gothic by the new Lutheran church (1893). The later generation of architects in the Finnish capital, under the leadership of A. Lindgren, H. Gesellius and E. Saarunen, who together erected the weighty buildings of the Fire Insurance Co. Polijola in Helsingfors, and to whom adhered other pupils of the Polytechnic school there, labored energetically in the modern endeavor to obtain entirely independent modern style forms.

In Russia in the capitals of St. Petersburg and of Moscow, the Renaissance current coming from the West in the first half of the 19th century caused an approximation of Classicistic architecture to the Italian Renaissance, but from the Neo-Romantic a return to the ancient Russian art (volume 1, pages 198, 202). This was at first connected with Italian or mediaeval forms from the West, but later became ever more decided and severe. The vast palace in the Kremlin in Moscow built by Constantin A. Thon (1794-1881) in 1839-1844 still stands on the

stage of the transition from Classicism to Italian Renaissance. On the church of the Annunciation at S. Petersburg attributed to the same master, which is crowned by five towers rising like pyramids, Russian forms are balanced by Italian; on the church of S. Catherine of the Wosnessenski Monastery at Moscow are Russian forms with Gothic. The grand church of the Redeemer at Moscow erected by Thon and Resanow in truly Russian magnificence already exhibits the Russian style in its purity. Yet more strongly are its peculiarities exhibited on the church of the Kiew Lawra (1898) at S. Petersburg, and on the Expiation church in the summer garden there, even surpassing these. Of the more important later secular buildings, the magnificent Commercial Row at Moscow (1888-1893) created by Pomeranzew even exhibits a certain clarification of the Russian style by R Romanesque and early Renaissance forms. But on the palace of the Duma erected by Tschitschugow and on the New Historical Museum of Sherwood at Moscow, it is employed without restraint.

Into AMERICA the Neo-Romantic movement already found entrance before the middle of the 19th century. In New York was erected in 1839-1843 Trinity Church in a very restrained style, but in 1850-1879 the cathedral of S. Patrick (by James Renwick) was built in a more mature Gothic. Likewise the Italian Renaissance is employed in the Library of Congress at Washington (188-1897), the Grecian, i.e., a Renaissance strongly approximating to Hellenism, on the Corcoran Gallery in Washington erected 1894-1897 by Ernest Flagg.

301 The amazing advance of the North American States after the civil war (1861-1865) led to a rich and independent development of North American art. An entirely fruitful field of work was afforded to architects in the commercial buildings, banks, structures for the great journals, hotels and not least in the residences, for the comfort and treatment of which in accordance with their own inclinations and customs, the well to do Americans retained a high estimation in the haste and lack of repose in their lives. Grandeur and model arrangement are exhibited by such buildings. The vast acquisitions in construction led to startling undertakings, which celebrated real triumphs, not only in the cowering of colossal halls, but also in the "skyscrapers" rising to dizzy heights for the purpose of

the extreme utilization of the building site. But the American architects not only master the architectural problems of planning and construction; they also give to their works since the last year of the 19th century a peculiar and independent stamp corresponding to the architectural treatment. H. H. Richardson (born 1839 in New Orleans), educated at the *École des Beaux Arts* in Paris, from 1866 an architect in New York, became a path-breaker of the new American architecture. In his Trinity church in Boston built about 1875, he returned to the Romanesque style of southern France and of Spain (volume 2, page 44; Fig. 60), and imparted to it a powerful Anglo-Saxon-American virility. This church forms a landmark in the history of American architecture. On a great number of other public and private buildings by Richardson, the style introduced by him came into full development. He had already acquired a position determinative for the general appearance of modern American architecture. It is characterized on the exterior by an architectural grouping emphasizing the purpose almost recklessly, by a great preference for round-arched openings, but especially by heavy rustication appearing everywhere as a leading motive and sometimes developed in Cyclopean massiveness. In general he exhibits great economy in properly architectural subdivisions and architectural motives; where such are employed, they always adhere to the Germanic-Romanesque world of form.

3. To the commercial buildings is peculiar a certain upward tendency; besides mediaeval motives they also accept those of the Renaissance, but always in a free and powerful treatment. (Fig. 300). The isolated country houses chiefly exhibit broad comfort. The American wooden construction also again comes into use on them. He produced in numerous villas an extremely harmonious relation of the architectural appearance to nature. The internal treatment follows the same principles, as were developed in the later English house. (Page 346).

The architecture of the colonies is entirely subordinate to that of the state, to which they are subject. Occasionally in the domains of the old civilized lands concessions are made to the racial architecture, even if with varying results. But the public buildings serving for assemblages scarcely differ in their style treatment from those of the mother country.

(Fig. 301). The opening of the protected domains to European civilization even compelled the transplanting of European art to the foreign soil. It then follows, even if at some distance, in its entire further course during the whole political and intellectual dependence on the art of the mother country.

IV. Architecture of the Present Time.

1. General Basis.

About the end of the 19th century appeared in increasing strength movements for reform in the domains of art, that soon led to a general movement in the sense of a direct opposition to the former artistic opinions. They are the result of that powerful transformation in the intellectual life of the peoples of central Europe, which had been prepared for in the literature during several decades. After the end of the fifties, new ideas, new problems for the world's opinions, commenced to powerfully influence the severely historical tendency of the literature. Schopenhauer's philosophy, particularly his work, "Die Welt als Wille und Vorstellung", at this time made its way with elemental force in the widest circles of the cultured. Soon afterward followed Nietzsche with his theory of the utmost possible elevation of the "I" and of the will to power, of the master's rights of the superman. In France appeared Zola with a magnificent exposition of his ideas in the service of the social problems. Similar tones sounded from Norway in Ibsen's dramas, and in a particularly clear manner from Russia in Tolstoi's works. In the reckless and egotistic forward pressure of the intellects possessed by the new ideas, in the struggle for freedom from all fetters, in the denial of tradition and of opposition to the authority previously enforced, there burned a hot contest of minds. It occurred at a time, in which basis-destroying transformations were completed in all scientific, technical and social domains, and the feeling of elevation above all former opinions filled in great measure science and technics. Ever stronger resounded the call, in literature as well as in the formative arts, to set out new in place of the old trees to be felled. It was realism with its mode of thought, chiefly creative from reality and actual observation, and naturalism in close alliance with it, and the employment required by it, of the sciences and arts, not in accordance with formal rules, but on a natural basis, which in the contest of opinions gradually won the victory over idealism. In the formative arts this realistic and naturalistic intellectual tendency appeared with a definiteness and sharpness, as in

had scarcely ever been the case. It was earliest expressed in painting and sculpture. In France Millet and Monet had broken the path for it in painting, and Meunier in sculpture; in Germany a host of artists of high purpose went the same way. In architecture, that by its entire nature required a longer time for obtaining new forms of expression, the new spirit appeared later. But it then expressed itself with greater decision, than in the two sister arts. Already for some decades changes in the problems, in the external conditions and requirements of architecture had prepared the soil for it, and so changed the basis for its development, that it already of itself pressed forward to leave the track already retained.

The most important scenes of architectural activity, the cities, in the last quarter of the 19th century had changed their entire architectural appearance. The reasons and the impelling forces for this lay in the fabulous advance in the industries and of the commerce developing parallel with them, as well as in the very influential transformations of the social conditions of our own time. The continued and increasing travel made the building of vast railway stations with colossal halls, great post offices and grand hotels, designed for hundreds of travelers, an unavoidable necessity. The plans for industrial purposes frequently extended over entire quarters of the city and gave to these a peculiar stamp. The central stations for light, water and power, to be erected in the midst of cities, already assumed modern forms on account of their places in the view of the city. The buildings for commerce, the exchanges and the banks required a treatment expressing their importance in the business world. Entirely novel problems in the treatment of interiors were proposed by the great warehouses and market halls of all kinds. The strong centralization of the masses of the people in the cities and the social conditions required buildings for vast assemblages of men and for their amusement and refreshment, such as society halls, concert halls, restaurants, cafes and the like; the satisfaction of the needs of education, extremely increased and in the largest classes, school houses of all kinds in quite enormous dimensions and with the best hygienic appointments. To these are still further added the likewise gradually becoming colossal

buildings for state and communal administrations for the public and the common benefit. In comparison with these architectural problems of churches, the chateaus and palaces, which previously formed the centre of gravity of architectural creation, pass into the background. It lies in the social and democratic spirit of our time, that the interest of the architects should now be devoted to the citizen's residence in a previously unknown measure.

357 The new problems of themselves led to new methods for their solution. The materialistic mode of thought, strongly promoted by industrialism and egoism pressed for an extreme utilization of space, time and technical means. The relation of support and load, as chiefly developed in the antique and the Renaissance, which had dominated architecture for centuries, lost its importance. The modern reinforced concrete construction made possible an extreme increase in the strength of the supports and a previously impossible increase in the weight of ceilings, so that men could advance to the widest spans of interiors. It brought a new statical condition of forces, which thoroughly transformed the esthetic principles of architecture. To this was added the almost unbounded enrichment in materials, such as were created from the abundance of the commerce of the world and were provided for architecture by the restlessly advancing manufacturing in numberless industrial products. These in part deeply important changes in the problems, in the bases and the requirements of architecture must of themselves lead to novel requirements in the artistic composition.

Their first result was the recognition of the unsuitability of the series of forms of the high Renaissance, before chiefly employed in secular architecture. The requirement already stated by Semper with farsighted views:-- "The solution of the modern problem must be freely developed from the conditions given by the present time", now became a fact. But not in Semper's sense. He wished to solve the problem "with reference to those traditional forms, which during centuries had been developed and retained as indisputably faithful expressions and types of certain internal and structural conceptions". Men were now exactly opposed to these. The desire for individual and entirely independent artistic treatment expressed itself

first in acute opposition to the further employment of historical style forms; but it appeared but slowly and only after a strong contest with the conservative forces of architectural creation.

It is a well known historical fact, that great movements, which had as a result a thorough advance of the nations in intellectual or artistic life, always went to the last extreme, which originated the most embittered strife between the best men of their time. But the decision of the questions in dispute did not result from definite principles, but in accordance with the actual requirements of the time. The survival of the fittest is an observed fact, not only in the contest for existence in the existence of nations, but likewise in the strife for the intellectual possessions of men, on which is perhaps based the entire course of civilization. Mankind is opposed to a principle in opposition to the spirit of the time.

But with the rejection of the traditional historical styles, individual forms suited to the period were not yet born, which could be set directly in their places. Sculpture and painting found new ways in direct association with nature. But architecture must first create its types. In the restless search and striving after new forms, it was natural, that the most zealous champions of modern aims should first go to the extreme, and give their requirements the rudest expression, before they were prepared to create new and permanent things. The oscillations of this movement now appear to have reached their greatest extent, and to strife for assured starting points. Even in the circles of the boldest innovators already appeared undercurrents, supported by the conviction, that in the mere denial or reversal of the ground principles previously followed in architectural forms are not found new guides for a reasonable solution of modern problems, and that also in this way the spirit of the time obtains no generally intelligible expression. Slowly was now developed a clearing of the aims. But from the securing of a modern style in the sense, such as before this we have employed the conception of "style", we are still far removed. A uniformity of expression in form, a unified feeling for style is scarcely to be established. We even stand only at the beginning of a new development, and in the

sum of the phenomena, we can only recognize and follow definite similar causes, that give to modern architecture still an individual stamp, chiefly in the first stage of merely personal seeking and treatment, independent of tradition.

II. The Development of the Modern Style. *

** When we speak of the "modern style", we leave out of consideration in the following all still abundantly appearing works in the architecture of the present time, entirely or principally designed in the historical sense. We rather concentrate our attention upon those architectural creations of the most recent period, in which with a conscious rejection of the historical, a new conception is expressed in a new mode of treatment.*

It was natural, that modern architecture commenced with its first reforms, where the 19 th century exhibited the most apparent weakness. This in general had committed its greatest errors, that in the endeavor after correctness of style, it had subordinated the most natural basal requirements for every architectural creation, appropriateness in plan, construction and architectural form, and the resulting reasonable employment of materials to the architectural appearance. The modern architects now placed just these principles as the primary ground **requirement** in the foreground of their creations, and they emphasized these from the first to the extreme consequences. "The modern architecture of our time seeks to develop form and motive from purpose, construction and material". So says one of the most influential of modern architects, Otto Wagner in Vienna. "It must be also as simple as possible, to clearly express our design. These simple forms are to be carefully adapted to each other in order to produce beautiful proportions, on which almost entirely are based the effect of the works of our architecture". * ‡ Appropriateness must be expressed in the general appearance of the architectural work, as well as in all its members, if the same is also to produce a satisfactory effect in an esthetic sense. For beauty lies first in the internal truth of the structural organism, each separate part possessing a definite function and expressing it. Thereby the construction obtains a basal importance for the treatment. It precedes this as determinative therefor. The mode

of thought of the architect is permeated by that of the engineer. But the demand for innate truth and suitability is also based on the selection and use of the materials. To satisfy it in regard to these the architect must possess a thorough knowledge of the proportions of the materials, which establishes a practical treatment corresponding to these. With particular energy under the accenting of this requirement was reference made to the great transgressions of the architecture of the 19th century, that in the imitation of the art of the ancients sometimes employed means directly calculated for deception, and not seldom impressed on the material employed, by the aid of machines the most unnatural forms and colors. The form must now result with right consequence from the peculiarities of the material and a corresponding treatment with tools. The hand work therefore already merits the preference, since it alone bears the charm of personal creation, and should again be brought into honor; the machine must only act upon it, where this assures for the mode of production, the desired form corresponding to the nature of the material. All processes of technics must be adopted by architecture, so far as they afford means for a simpler solution, for a more intelligible and modern mode of expression. From new materials are to be derived new and beautiful values contained in their natural appearance, and particularly in their colors. The colors may generally be important means for producing harmony and concord in rich measure in the service of the modern art of interiors. On the contrary the ornament, even if it cannot be entirely omitted, must retire behind the essential obedience of the technical requirements, and particularly behind the esthetic effects contained in the materials.

* * Otto Wagner. *Skizzen, Projekte und ausgeführte Bauwerke*. Vol. 3. Heft 35. Vienna. 1906. Also see Joseph Strzygowski. *Die bildende Kunst der Gegenwart*. Leipzig. 1907.

These requirements are not novel; Semper had already emphasized and thoroughly demonstrated them (page 323, 365), and likewise Ruskin (page 343); William Morris (page 346), who was absolutely a Gothicismist, in 1859-1861 had based thereon his own house in Bexley Heath in England and his path-breaking industrial works, thereby producing a complete reform of the English

art industries. That was the conception of art of the architects standing in the front rank of the modern movement, which differs from that of the before mentioned artists, and which consists substantially in this, that modern architects desire to fulfil these ground principles with the utmost possible, or the entire exclusion of all historical style forms.

The beginnings of the modern movement in architecture may be referred to the commencement of the nineties of the last century. Already the first attempts permit the recognition of opposition to the art style previously employed, particularly of the high Renaissance; perhaps they proceeded rather from the opposition to the customary, rather than from well considered conceptions of historical styles. Certainly the endless repetitions of the form apparatus of the Renaissance in an inartistic, spiritless and frequently entirely displaced imitation produced an unequaled monotony of modern street views. One jolted over the ground principles of the Renaissance, the symmetry, the severity of the orders, over its entire organism, but soon became aware, that one could not advance in this way, and therefore gradually passed over to entirely new forms. Thereby the artistic freedom was fully accepted, and no wonder if it at first put forth quite doubtful flowers. To novelty and individuality was much sacrificed at the expense of the beautiful; with crude and momentary flashes not infrequently commenced a bold play, yet the best balanced champions of the modern art tendency were assured of loud approval of the technical press served by them, as soon as they even brought something "novel" and not yet existing into the plan. In the rapidly living time the movement progressed mightily; about the end of the century, it had already comprised extensive classes.

In the year 1901, the artist colony, called by the art-loving grand duke Ernest Ludwig of Hesse for the free culture of modern art in his capital, opened its Exhibition on the Mathilde hill in Darmstadt. In a number of completely executed buildings, arranged ready for use and occupation, among which the house for a single family occupied the most important place, the Darmstadt artists gave a view of their creations. The design of the general plan of the exhibition and the greater number of the buildings, as well as the superintendence of the

whole was in the hands of Joseph Olbrich, who was born in 1867 in ~~Troppen~~, had received his training in Vienna under Hasenauer and particularly under Otto Wagner (page 335), and by journeys in Italy and France had become acquainted with architecture in those countries. In the principal catalogue Peter Behrens (born 1868) gave in the introduction, to which he prefixed the description of his own house, a kind of artistic programme for architecture in general, and particularly for the plan and arrangement of his house for one family. This exhibition aroused vast attention; it denotes a landmark in the development of modern art on the continent. Thenceforth the new movement obtained fixed aims and definite guide lines; in the course of the succeeding decade it won, not only in architecture, but also in the art industries an incontestable victory over the exclusively backward-looking style tendencies of the preceding century.

Until now the modern style has chiefly appeared on those buildings, which presented new problems for solution. In the foreground stand the structures for the industries, and indeed first those for the production of goods, the manufactories, and then those for the sales, the warehouses. The erection of manufactories previously belonged almost exclusively to the problems of the engineers. In them already for purely business reasons, the basal requirements of the modern tendency, the suitability in plan, construction, and the employment of the materials, came to a severer execution; these demands formed the fixed and determining basis for the plans and calculations to be made by the engineer. The manufactories also had earliest developed the method so strongly affecting the structural organism, of concrete reinforced with steel. The new conception chiefly expressed itself on them in the abandonment of the former structures like barracks, in favor of architectural groups; for men saw the grand effect here desired, no longer in the long lines of facades with many stories, but rather in the alternation of separate structures, tasteful in mass, height and treatment.

An entirely novel form was received by the department store. For this was required the most advantageous utilization of the interior for the purposes of storage, exhibition and sale, for

a convenient, overseen and easily controlled access of the public, a corresponding admission of light and air, and a thorough utilization of the enclosing walls for the purposes of lighting and show. Consequently for the facades was developed a novel architectural scheme. The proportion of the wall openings to the wall surface fixed during the Renaissance period proved itself impossible. Especially in the lower stories, the windows must be made as large as possible, and thus the remaining wall strips left as supports must be reduced to the extreme limits possible. Steel offered a structural material appropriate for this, yet not by itself alone, but already on account of its small resistance to fire, within a casing of natural or artificial stone. For this concrete mixed with cement, sand and gravel afforded an excellent material, since it possessed the valued property of combining with steel into an organic unity of high resistance. The entire surface of the facade was then resolved into piers, and at the heights at which these had to receive the internal beams and their loads, they were connected by horizontal beams of reinforced concrete, thus obtaining a skeleton construction, which left entirely free the surfaces lying between the piers and the horizontal beams. If as generally the case in the upper stories, it was not desired to extend a single window in these openings, then could be arranged a subdivision by tracery. Thus was developed a mode of construction, which is closely allied to the Gothic buttress system (volume 2, page 78). But it appears here entirely as an independent solution of one of the most important problems of modern architecture. In its ground lines it is found in the business office building erected by R. Norman Shaw in 1872, generally known under the name of New Zealand Steamship Company in Leadenhall St. in London (page 349; Fig. 292). But it was first developed in Germany into a consistently executed architectural system. The actual creative building is the warehouse (department store) Wertheim in Berlin, built in the years 1896-1900 by Alfred Messel (born 1853 in Darmstadt, died 1910 in Berlin), a pupil of H. Strack (page 286). The Gothic keynote is here apparent at the first glance. In the details of the main facade, besides purely novel forms and Gothic motives, are employed those of the Renaissance and the

Barocco, but which produce an entirely **novel** impression, since they are detached from their original organism, and here must assume entirely different functions. The facade toward Vossstrasse represented in Fig. 302 and executed in the year 1900 has chiefly Gothic forms of detail. In nearly all the larger cities department stores have since originated, on which the new type is developed in a model manner and not rarely with an entire rejection of historical forms. An extraordinarily advanced example in the opening of the wall surface between massive piers is presented by the facade 249.4 ft. long of the department store Tietz in Leipzigerstrasse in Berlin, designed by Bernhard Sehning (Fig. 303).

The architectural system of the department store was also transferred to the other business buildings of the larger cities. Indeed in most of them it is **not carried out with entire consistency**, since as a rule great openings for shop windows in the wall are only necessary for the lower, or for the two lower stories, while the upper stories are used for office or residence purposes. Therefore here is found instead an approximation to the architecture of the dwellings built in blocks. The division into rooms permits and requires broader wall piers between the windows. The need of light and air and the most favorable view of the street here leads to a projection of certain wall strips, or of all lying between the piers in the form of prismatic or segmental surfaces, or even to the insertion of a series of windows occupying this entire width in each story. Likewise for this R. Norman Shaw gave a model in his *New Zealand Chambers*. (Fig. 292). On the continent Martin Dülfer (born 1859) created in the Office Building of the *Allgemeine Zeitung* in Munich, erected in 1900-1901, a prominent and much approved work of this kind. (Fig. 304).

Next to the buildings for industry, the citizen's dwelling indeed occupies the most prominent position in modern architecture. Without doubt the English, and besides this also the later American architecture, have here exerted a mighty influence. Here as well as there, to afford free access of light and air, as a building site is chosen a garden, which enjoys particular attention in plan and maintenance. Therefore for the larger cities are developed villa colonies outside the in-

internal domain of the city. The grouping of the rooms follows the requirements of suitability, convenience, hygiene and the individual needs of the family, without permitting the consideration of the treatment of the facade to control. The central point of the house is formed by the hall or vestibule (p. 345); next it are arranged the separate chambers and the living rooms, so far as the latter (particularly the kitchen) are not located in the basement. For obtaining sleeping rooms, which will be entered by the morning sunshine and living rooms in the best location with regard to the sun and the outlook on the landscape, great care is taken. Broad bay windows and alcoves enhance the convenience of the rooms and give them a homelike character. The admission of light is so regulated by the arrangement of the windows in reference to their position and form, as they seem most suitable for each room, according to its purpose, and the feeling of the interior is favorably influenced. Likewise the positions of the doors result from careful regard to these. By means of terraces and balconies care is taken, that in winter sunny and free places and cool ones in summer are at command, and that a certain connection with the garden is produced, without necessarily leaving the house. On the exterior the modern dwelling represents an entirely new architectural view. The earlier and mostly common geometrical box form is dropped, and almost invariably symmetry as well; the entire mode of solution of the ground plan compels a very free treatment of the architectural masses and an outline with animated movement. Even on these residences in which the rectangular ground form is retained, the arrangement of the doorways, windows, bay windows and the forms of the roof produce a novel impression. The portals preferably extend externally, in order in a certain sense to invite comers to enter, and to already afford shelter from the weather outside the doorway. (Figs. 305, 309). The windows have changed their previous proportions of breadth to height. They are often arranged as horizontal rectangles and preferably in a series beside each other. The roof cornice terminates the facade, sometimes with a horizontal projection casting a deep shadow (Fig. 313), sometimes rising like a curved gable, and particularly so when attic chambers are arranged with windows in the enclos-

enclosing walls. (Fig. 314). The uppermost window openings in this case generally have freely outlined forms. (Fig. 304). The roof attains a previously unknown importance; it is strongly emphasized as protecting and warming, a hood carefully terminating the house at top. Well protected dormers are treated in the most diverse forms and give it a friendly appearance. Likewise the chimneys, indicating an abundant care for the warming of the rooms, project from the roof and are included in the general view. These frequently appeared as neglected in the organism earlier common. The treatment of the vertical motives acting in the bay windows and piers presents no difficulty to most modern architects; they insert these directly and simply stop them below the projection of the roof, undisturbed by the "suggestion of the forces". A technically well executed rough plastering, in which modern architecture finds great pleasure, combines the frequently subdivided architectural masses into a unity, or where animation of the surfaces is desired, affords an alternation of light and dark, or of rough and smooth surfaces. What is still lacking to the external appearance, it is sought to attain by a tasteful coloring, also particularly taking into account the surroundings. In Germany the family residences erected by the Darmstadt colony for its exhibition of the year 1901 are the earliest consistently executed buildings of their kind. Fig. 305, the Keller house in Darmstadt, designed by Joseph Olbrich, gives a characteristic example of this.

Yet more strongly, directly and permanently is expressed the influence of the Darmstadt artist colony in the internal decoration and arrangement of the house. Each room receives a treatment in accordance with its purpose, which extends not only to the walls, doors, ceilings etc., but also to the furniture, rugs, hangings and all accessories. In order to make possible a unified and connected decoration, these arrangements, which by their nature are not to be treated as movable, thus especially the furniture chests and wardrobes for storage are mostly treated as if built-in or otherwise are permanently connected with the wall. Each separate room is harmonized in a carefully selected color tone, also calculated for its special purpose of occupancy, as well as for a harmonious and effective variety

315 In the sequence of the rooms. By the monochrome wall hangings of cloth or paper with inconspicuous pattern, over which the eye passes without taking interest in the details, a very quiet harmony is produced. Aside from the introduction to a great extent of hygienically favorable and durable linoleum covering, the floors have experienced slight changes. On the ceilings prevails gypsum plastering with recessed panels and coffers, already on account of their construction in reinforced concrete; their subdivision follows with reference to the greatly preferred electric lighting fixtures, that are arranged at several points and diffuse a uniformly distributed light in the room. The form treatment of the furniture exhibits an entire freedom from tradition; it even goes so far, that the different articles of furniture are constructed entirely with pre-suppositions, and as if we were at the primitive beginning of the art industries. Chairs and tables, which for centuries exhibited in general the same forms, now receive new forms, which are indeed frequently surprising in their self-evident suitability. The endeavor to reject everything inorganic and to create a unified and simple whole leads to a thorough rejection of ornamental superfluities. In the ideal treatment of the ground form, the rhythmic movement of structural guiding lines,

316 that give a living expression to the esthetic problems of the parts of the equipment, appears the **best** ornament to the modern artist of the interior. The beauty and genuineness of the materials, a pleasing color treatment of the same with rich use of all architectural products, particularly of the modern glass and ceramics with a model execution, on which modern art industry looks with justifiable pride, give artistic completion to the arrangement. Our Fig. 306 presents a view of the hall in the Glückert house at Darmstadt, that was designed by J. Olbrich and executed under his supervision. Fig. 307 is a design for a room by Patriz Huber, who unfortunately departed too early from this life, and that had created in the Darmstadt colony a series of harmonious interiors. The design is characteristic for his arrangements of interiors, and likewise for the internal art of the modern style, as this developed in itself, chiefly under the influence of the Darmstadt artist colony during the first years of the 20 th century. The Exhi-

Exhibition of Art Industries held in Dresden in 1906, which presented a great number of modern interiors of every kind, already permitted the recognition of a return to more quiet lines (Fig. 308, a dining room by Bruno Paul).

Among the public secular buildings, chiefly the school buildings derived rich advantages from the innovations introduced with the modern style. In them the requirements in regard to the dimensions of the length, width and height of the class rooms, the proportion of window area to magnitude of the room, and particularly the forbidding of openings in the walls before and on the left of the pupils, under the old facade system based on symmetry of the whole and of its subdivisions frequently presented great difficulties for a satisfactory solution. Freedom from the compulsion to a regular treatment of the facade, mostly based on the use of the antique orders, the natural development of the ground plan and structure only in accordance with the location and form of the building site and the programme of internal requirements, the flexibility in the arrangement and form treatment of the windows, the desired alternation of large closed surfaces with those opened by rows of windows, led comparatively soon to a definite type of school building, that in reference to its very apparent suitability and reality belongs to the best acquisitions of modern architecture. On the contrary, the city halls were relatively little affected by the innovations. The modern cities indeed did not in general fall behind in the expression of their power and a grand conception of their problems, or in participation in the artistic interests of the entire people; they show this by the founding and zealous fostering of city museums of antiquities and of art, among others. But so far as it concerns the city halls, generally the citizens' pride in the native art, the regard to the historical presumptions of the city, and in connection therewith the consideration for native motives, especially for those of the German Renaissance held the supremacy over the endeavors of the modern art, entirely lacking in presumptions. But the new spirit then is expressed in the picturesque grouping of the architectural masses about a tower, happily inserted in the architectural mass, in the omission of symmetry and in the freedom and independence of the forms. †

Likewise the other public **secular** architecture, so far as it relates to the evolution of a monumental architecture as an expression of a definite circle of interest, influence and power, was but slightly fertilized by the modern style. For the columnar architecture of the Grecian and particularly of the Roman antique, corresponding in such a high **degree** to this problem, no perfect substitute has been found. The charm of the novelty of a pier system arranged in any manner, the alternation of flat wall strips with those hollowed inward or swelled outward and the like does not suffice for this. Therefore the architects devoted their attention chiefly to the most impressive treatment of the portal, which attracted the eyes of observers to them. J. Albrich gave a model for this in the portal of the Ernest Ludwig house in Darmstadt. (Fig. 309). For the later time reference may be made further to the portal of the City Art Hall at Mannheim erected by Hermann Billing. (Fig. 310).

Church architecture on the whole appears still reserved with regard to the modern movement, indeed that of Catholicism more than that of Protestantism. The requirements of the service have not changed; the Catholic church architecture had already created architectural forms in the preceding periods, that entirely corresponded in purpose to the established requirements, while the much younger Protestantism has not yet attained to a typical solution of the problem in its church architecture. Therefore its problems lie nearer to modern endeavors than those of Catholicism. Yet there is manifested in the new buildings of churches for both confessions an inclination toward freedom from retaining a fixed scheme in the proportions of the interior and a stronger striving for unity of the interior. The unrestricted sequence of the room and the freer position of the tower frequently compels a picturesque effect enhanced by the lack of symmetry, such as appears in the (Protestant) church of the Redeemer in Stuttgart, built by Theodore Fischer. (Fig. 311). The ground plan of this church is that of a rectangular hall with a side aisle and a gallery, with a semicircular apse. While the architecture here in general also exhibits reminiscences of the early Romanesque middle ages, Otto Wagner passes over to entirely free forms in his (Catholic)

church of the Lower Austrian Provincial Hospital and Asylum in Vienna. (Fig. 312). It is a domed church with a Greek cross plan with the front arm lengthened by the addition of a vestibule. The primitive plan appears here in a modern mode of construction, chiefly composed of steel and copper, and in an entirely novel architectural exterior. On this Wagner embodied the ground principles of suitability to purpose, truth in materials and durability in the most thorough sense. As he says in the explanatory report on the design prepared in 1904; "the materials employed for the erection of the building are evidently the best conceivable, and thereby regard is paid so far as possible to the requirement of eternal duration, inseparable from architecture". The surfaces of the facades are faced with marble slabs 0.79 inch thick, that are held by bond courses 11.84 inches high and 1.58 inches thick. The latter are fastened by copper heads left visible and screwed on steel anchors passing through holes in the marble slabs and fixed in the walls. (The same method of covering was chosen by Wagner for the Postal Savings Bank in Vienna, built in 1904; Figs 315). The construction of the drum and dome is entirely executed in steel covered by stamped and hammered copper sheets. The strong emphasizing of the system of incrustation determines the external appearance, but also lessens the impression of the powerful and the monumental, since the covering conceals just those parts of the construction, which have to take the static functions of support and bearing.

The architectural treatment of the details permits the distinguishing of two main currents in the modern movement. One of them proceeds from the basis given in the historical styles, while the other is directly connected with them. On the part of those architects, whose art designs are inclined to a bold and nucleate treatment, and for such buildings, that according to their purpose should express force and stability, the early mediaeval forms enjoy a certain preference. But where a rich form expression is desired, the late Gothic, the Barocco, and particularly the Biedermeier style, whose art tendencies exhibit so many tendencies in common with those of modern times, (page 269) form the basis for a new creation, to be developed further. The adherents of this tendency have a strong support

in the animated interest in again securing a permanent native art, extended throughout the largest classes.

The other current of the movement in a more restricted sense "modern" artists decide for an entirely uninfluenced and independent treatment of the details. Yet these are still not united in their aims. A portion of them is completely permeated by the mode of thought of the engineer, who erects buildings for the purposes from a purely utilitarian standpoint. They see in the direct effect of the form for the purpose and in the accenting of the construction and of the character of the materials, the most important and most satisfactory esthetic moment of the architecture, and therefore reject all ornamental decoration in the most thorough manner. There is expressed herein the reaction against the art conception of the preceding period based on ornamental richness. Doubtless the architects engaged in this direction, who are not unjustly designated as "Puritans", thereby acquired high merit for leading modern architecture into sound paths, that they required a strict purification of architecture from all superfluous accessions and carried this out on their buildings.

3-7 Opposed to them is another group of architects, who see the principal attraction of their works just in free decoration by ornaments kept entirely modern. These are chiefly guided, not by regard to structural development; they rather consider the façades as surfaces, that may be decorated by correct thought. Not seldom are entire façades dominated by ornamental decoration; even the construction and the doors and windows are arranged accordingly. Otto Wagner, who is such a temperate leader of the new school in Vienna, in regard to the employment of ornamental forms, on his Business Building in Wollzeile (Woolen Row) in Vienna uses this kind of surface decoration for animating the façade, monotonous on account of the uniform distribution of the windows. (Fig. 313). The decoration appears as a single covering hung over the entire front from bronze lions' heads beneath the main cornice. But the ornaments are still modestly arranged within the definite network of the windows without reference to it. An infinitely greater importance is assigned to them on the Business and Apartment Building in Schadowstrasse in Düsseldorf built by G. Wehling in 1899 and

3-2 represented in Fig. 314. Here not only the form of the windows in the uppermost story, but also the entire termination of the façade is dependent on the lines of the ornaments. The upper story no longer has any organic connection with the substructure. This façade certainly forms an extreme in the style tendency designated. Its most fruitful field is found in private architecture, where the need of decoration is less supported by art and esthetic criticism. To individual character and artistic caprice is thus opened a field for the freest activity. There originate buildings in not a few cases, such as one was previously at most accustomed to see in exhibition halls, which were only erected for temporary purposes and by their entire nature were desired to produce effects attracting attention by the simplest means. But in the final result, such a procedure in "architecture" must lead to anarchy in style, that certainly does not further the obtaining of fixed artistic ground principles for the architectural creations of our time.

3-3 The two tendencies here mentioned denote the extremest limits of the modern movement. But most architectural creations of our time spring from a conception, that retains the middle line and according to the predominance of the personal art imagination or the kind of architectural problem sometimes turns more to one or the other side. If one looks over the architectural forms or the details of modern buildings in their entirety, then the most striking novelty lies in the almost complete abandonment of window architecture. Enclosures of the windows in the manner in which the Renaissance and the Barocco treated them, are almost entirely omitted. Occasionally are found splay and cavettos with mouldings in a manner similar to that employed on secular buildings of the middle ages. In the modern art, the windows are properly only openings, that result from the structural framework itself, or which are cut at pleasure in the wall surfaces. Otherwise the architectural structure as a rule only retains from the entire subdivision the base and the principal cornice. The division into stories by belts is rare; only exceptionally is this still emphasized. The treatment of the detail forms on the bases and capitals of columns and of piers, on the portals, bay windows, main corni-

cornices and crowning members is entirely individual. Thus if for example, Otto Wagner treats his members entirely in the naturally appearing and technically wrought form of the solid materials employed. We here see the plane surfaces composed of materials, that are sawn, cut or rolled, that are carved in metal, hammered, punched and the like, beholding the whole composed of numerous separate rigid forms (Fig. 312, 315). But Van de Velde forms his members as if they consisted of a soft and plastic material, which at the intersections and endings, and particularly where pressure and resistance should be expressed, grows out into knob-like forms, recalling the structure of bones. With the requirement of consistent truth in materials for the mode of formation, this cannot certainly always comply.

According to the strict conception of the modern architects in the architectural treatment of the buildings, the ornament only possesses a justification in so far as it is serviceable to the clarity of the architectural expression, thus indicating the statical function of support or burden or the subordinate effects of definite stresses. The same requirements were also already **determinative** in earlier periods, particularly in the best times of the Grecian antique and of the Gothic for the employment and treatment of the ornaments. But modern art seeks to satisfy them by entirely novel means. Likewise in this are to be distinguished two tendencies. A portion of the architects see in the course of the lines and in the **tasteful** alternation of abstract forms, whose basis is formed by a non-existing course of lines, consisting of geometrical interlacings or repeats or entirely free, with a color treatment forming the chief moment. (Fig. 316). The other tendency takes its ornamental forms from nature, and particularly from the plant kingdom. Its forms are in part freely conventionalized, so that the natural models are no longer recognizable (Fig. 317), and in part are reproduced with an acute accenting of characteristics. Not only the forms of leaves and flowers, but also the roots, the branches, the form of the stem and bark, the junctions of the twigs and buds are thoroughly studied and employed in accordance with the legitimate manner dictated by their functions in nature. In decorative painting living bei-

beings further play an important part, particularly fishes, birds, lizards, frogs and the like, and even landscapes. If the use of living objects in ornament chiefly manifests the enjoyment of nature, then landscape motives only serve substantially for the production of harmonies. For the manner of their use Japanese art becomes a model. The turmoil of the waves, the cloud band (volume 1, page 49) appear in a very free conventionalization, animated by plant and animal forms of all kinds. For example, we see here the swan, that sometimes moves among animated waves (Fig. 318), sometimes swims toward us from the windings of a watercourse bordered by reeds; there the forms and the landscapes are so simplified in the course of the lines and the colors, that the model at most may be recognized in the outlines and in two or three ground colors. Just for this sort of observation of nature has Japan given valuable suggestions. Modern plant ornament has the advantages of great diversity and mobility, with evident clarity and simplicity; it has an extraordinarily fruitful effect on the style of decoration, particularly on glass staining, ceramics, the mosaic arts, and on all the minor arts, giving new life to them. And yet it may not be satisfactory as versatile, since the general loss of rhythm, the proportions, the contrast and the symmetry, on which the existence of the ornament is based, are not always fulfilled. Therefore appears in increasing measure the inclination to adopt historical motives capable of development, especially those of mediæval art, of the Barocco, and of the style of Louis XVI, and to give them a modern life.

Likewise architectural figure reliefs enter new paths. The classicistic architectural sculpture, petrified in conventional lack of expression, frequently only loosely connected with the construction, must give place to a realistic tendency. Not the classical repose but movement, as required in the representation of labor, is here expressed, and indeed in a conception of the object and its material. This of itself led to a treatment allied to the Barocco. The Barocco figures are tastefully introduced in the modern architectural form in their composition and development, and enhance its grand effect. Certainly the appearance of the supermen here leads to absurdities; but these are not seldom to be placed to the account of a

less happy mode of conventionalization, that the powerful emphasizing of the characteristic strives for at the cost of the details. Yet even the modern reliefs also in the better works obey the ground requirements of great simplicity and self-evident means, with a suitable subordination to the great lines of the architecture, which is to be accorded to them as a special merit.

Decorative painting likewise has freed itself from most traditions and goes its own way, even if it does not proceed divergently from ancient oriental influences. Characteristic of its conception is the exclusion of deceptions in relief and in perspective. Painting rather seeks to treat the wall as a surface in accordance with its purpose of enclosing the interior, and therefore it rejects the polychrome treatment in favor of two or three carefully harmonized colors placed beside each other. This most plainly appears in glass staining. Puritanism requires great simplicity in the ornamental and figure painting of rooms. Only in the most recent time has it again prepared itself for an advance.

Further mention of the prominent creations of leading architects, as they were given in the earlier chapters, must be omitted by us. For an estimate of their places and importance in the history of architecture, it would be difficult to secure a fixed standpoint already at this time, from which might be further observed with a comprehensive view, objects and appearances not yet come to rest, and to objectively decide on them. Also there indeed scarcely exists an opportunity for the enumeration of further evidence for the preceding statements; let one but attentively observe the modern buildings, as they are erected almost everywhere, and he will find an abundance of examples.

The modern movement takes in architecture in nearly all civilized states the same development; but it found in Germany a particularly favorable soil. If one looks over its previous acquisitions with a scrutinizing eye, then is presented to us a varied picture of strongly pulsating life. Modern art has given to the youthful artist world the strongest impulse toward free and joyful creation. It also seeks to permeate our entire culture and all classes of society. Not only the im-

imposing house of a nobleman in a villa suburb, but also the simplest dwelling in the modern workmen's village receives from it an individual stamp. Yes, perhaps it is just the worker's house, that derived the greatest benefit from the regard to extreme suitability, convenience, adaptation and durability. The sharp accenting and consistent carrying out of the fundamental requirements for the architecture, freed from the formal compulsion of traditions, in its permeation by modern technics, introduced an advance, most highly important for the evolution of architecture, which first of all is recognized in the entire transformation of certain architectural types, and indeed in a sense required by its purpose. Also we now already have a greater number of modern architectural works to indicate, which as an artistic entirety merit our full consideration and wonder. But otherwise in the flood of phenomena and from the purpose of the culture currents of our time may not be crystallized a consistently developed art conception and art expression. The haste in seeking and striving for new forms produced such disquiet in art taste, that today is rejected, what only a few years since caused astonishment as a great artistic work. We shall only enter safe paths, when architectural creation is led by ground principles, which besides purely practical aims, at the same time presents a fixed and unified artistic programme. Indeed in every time of transition has not been wanting a wonderful mixture of styles and bold new forms, which have subsequently shown themselves to be without result. But in the older forms was required a positive scale, which -- and we must not deceive ourselves concerning this -- is lost with the complete freedom from the art of the past desired by modern architects. A substitute for this is not given by the guiding lines derived from the requirement of suitability, structural truth and genuineness of materials. With the fulfilment of this requirement in general the interest of the engineer in his buildings is exhausted, but not that of the architect, who is at the same time an artist, or should be one; besides this and according to the purpose of his architectural work, he yet seeks substantially for the impression of comfort, of joy in existence, of prosperity and sufficiency, and to produce the feeling of greatness, power, dimensions, elevation, earnestness,

cheerfulness, magnificence, charm and the like, which as a rule can only be attained by correspondingly beautiful effects of his creations. But purely beautiful things do not result from the engineer's technical satisfaction of practical needs. Just as little the prominence of construction and of the material can be in the esthetic sense the chief purpose of any kind of "artistic" creation. Technics and materials are no creation, but only conditional factors, that serve the artistic power of production, the active will as means for the purpose of beautiful treatment. We have earlier seen, how among the Egyptians the vast pressure toward monumentality created the technics required for this activity, how with the Greeks the very refined art feeling developed into a glorified orderliness the construction for the embodiment of its formative ideas, how the Romans in accordance with their enlarged circle of civilization and their conscious power extended it for their needs and even carried it to grandeur, and how the middle ages embodied its art will directed toward the spiritualization of the material in technics worked out to the last result. Technics only afforded the means and methods for the physical production of art works, but never a starting point or leading factor for the power of artistic creation. This subordination of technics to art will is expressed even more sharply in the different periods, the greater the maturity of their culture. In the culture stream of our present time, that is so impulsive and so rich in new purposes, we may at least hope to be able to develop a striking style and a permanently satisfactory expression. If we desire to advance, we must give to the artistic primitive force, to the innate in us to beautiful treatment, that aims and guides, that come from the maturity of our culture, and we must advance with the progress of the spirit of the time in art life as well. Besides and with the extreme fulfilment of the problem in regard to purpose, technics and material, of our buildings, we must also seek to give them a beauty corresponding to their purposes, a beauty in which the mode of thought of our time receives a likewise characteristic appearance, as was the case in the earlier centuries.

The seeker for beauty in architecture, perhaps more than in any other domain of art, must be guided by clear processes of

thought and by fixed and lasting conceptions. But by the complete rejection of traditions, these would renounce their most secure starting point and support. Likewise in art are laws, that continue permanently, that can just as little be lost, as in the experimental sciences; the neglect of these laws can only result in a restriction in the natural course of development. Modern art is only one link of the chain of culture extending back to the earliest epoch of human intellectual life and continuing through thousands of years. Like each preceding art style, it is the product of a long development; this development cannot be carried further consistently, if one does not know the way in which it has come, if he must in a certain sense again start from the primitive condition of the formative arts, and wishes to reject the extraordinary wealth of experience and of the power over form, which the culture of earlier centuries has left behind. Not by the denial of the importance of tradition, not by the reversal of its ground principles, but by a conscientious examination of its acquisitions, in what manner these may be revalued and cast into new forms, as this occurred in earlier times of transition from one art style to another, shall we succeed with assured aim in grasping the problems of our time, whose entire world is bound by numerous cords to those of the past epochs of civilization. This examination indeed must not limit itself to a formal comparison of styles. Only the genetic method, following the growth and the development, in order to understand the completion, which is indeed native in all domains of research, can here lead us to the aim. The deeper penetration into the history of the evolution of architecture gives us the most valuable indications for a resultful development and clarification of the style feeling; it warns against evil outgrowths, produces tolerance of amateurs, and is only opposed to looseness of style; it principally impels observation and criticism, and thereby arouses the consciousness of independent creative abilities; it forms, what is indeed the most important, good taste seeking for beauty, which also in architecture denotes, and must denote the truly creative force. In bringing out a historically founded understanding of the present time, we shall best assist in a permanent further development of art, corres-

corresponding to the problems of the civilization and to the spirit of the most recent time.

ARCHITECTURE
in its
Development from the Origin to the present Time

Introduction to its History, Technics and Styles

By
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Volume III

Barocco and Modern

With 318 Illustrations

Leipzig

1911

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Urbana. Ill.

1912

PREFACE.

The present volume treats of the evolution of architecture in the last three centuries. The preeminent buildings of the Barocco and Rococo periods is regard to grandeur of treatment of interiors as well as richness and elegance of the external and internal architecture, and the abundance of notable events of the two following periods require a fuller consideration in this work, than has so far been afforded in the comprehensive works on the history of architecture. Of the architecture of the present time, by stating the modern endeavors, particularly its opposition to the preceding tendencies in art, and by indicating the new architectural problems, new solutions and new forms with the presentation of some particularly characteristic examples, I have attempted to give a characteristic general representation of its present state. Its value in the history of architecture is based on the conception of the nature of architecture as art, as the expression of the power of form innate in all civilized peoples, that for thousands of years has lent the stamp of the beautiful to their creations. Therefore for this were determinative the same basal views, from which originated the treatment of the history of the evolution of architecture here presented.

The publisher has again assiduously endeavored to anticipate all my wishes relating to the number and the reproduction of the illustrations and to the entire manufacture. Thus I may well state the hope, that the work now completed, the two first volumes of which have already found their way beyond the limits of German speech, may find a wide distribution, and by its ~~treatment~~ contribute to a more thorough and historically grounded understanding of architecture, and thereby to a clarification of important art questions of the present.

Stuttgart. Nov. 1911.

Karl O. Hartmann.

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I. ARCHITECTURE IN THE PERIOD OF THE BAROCCO AND ROCOCO STYLES.

General Basis and Character of the Styles.

The period in architecture succeeding the late Renaissance is generally designated the Barocco style. The name "Barocco style" is generally referred to the Portuguese expression "b" "barocco" for oblique round, irregular and oddly shaped pearls, and it signifies in a general sense an exaggeration in the treatment of forms and an overloading with wonderful ornamental work, even to aberration and tastelessness. If one desired to indicate thereby a criticism of the art style in question and of its worth, this would be entirely impossible and improper. For like every other clarified art style, the Barocco has its innate justification in the history of evolution. The period dominated by it acquired by its art not only just as expressive an exhibition of its purpose in the history of civilization as any of the preceding periods, but it also first brought certain countries to the climax of their arts, of which the more important works may worthily be placed beside the best productions of other art countries and periods.

The Barocco first forms an unavoidable consequence of the Italian Renaissance; already the art of antiquity and indeed both the late Grecian and also the late Roman represent a parallel evolution. We have seen (volume 1, page 136), how in the last period of antique art the endeavor to represent the powerful and mighty, the more picturesque principle in the grouping of the architectural masses, the enlargement and increased number of the members, the previously unknown accenting of the masses, the use of columns and cornices in a purely decorative sense, and even the treatment of the details in the lines of the members, in the profiling and ornamentation, appear in an entirely similar manner as harmonious characteristics of the style, as they also now become characteristic for the style after the Renaissance. Here as there in the most abundant extent, sculpture and painting were likewise placed in the service of architecture, indeed so that the borders of the different arts ever more disappeared and passed

into each other, to finally form a unified whole, calculated for a rich decorative effect and for external show. Here as there the "Barocco" art appears as the product of an astonishing and exaggerated creative form of an entire period. As it then its forms found the greatest employment among nearly all civilized nations, so likewise in the 17th and 18th centuries, they conquered nearly the entire cultured world. In relation to the Renaissance, the Barocco then forms the last phase of its evolution in style, in which after passing its climax, it enters on a further enhancement of its structural and ornamental works, and into a search for new and more effective attractions.

If thus the origin of the Barocco style on the one hand finds its explanation in the continuance of the artistic evolution, so was it on the other hand also a necessary result of the civilized and intellectual life of its time, full of strong religious and political movements. In a much more comprehensive measure than ever, the church took the formative arts into its service. The courageous zeal for the faith, from which the counterreformation sprang, required for the expression of its unquiet impulse to activity and its pathos more extended means, than the Renaissance was able to offer; these must then reach a so much richer and unified development, so that the ecclesiastical life attained an unusual period of splendor, at first in Italy and later also in the entire Catholic world under the lead of the "Society of Jesus", and that was recognized by a prominent advance in church architecture. Entirely similar conditions lay at the basis of the evolution of secular architecture. The secular princes in the 17th century entered on the period of their unlimited rule and their highest external magnificence. More than before, they employed art to satisfy the requirements of the court. The continually increasing search for show and the extravagance of expression, that was peculiar to that time, must likewise be reflected in the art at the courts and in all architecture. To this was added the epoch-making acquisitions in the natural sciences (Copernicus, Kepler, Newton), that soon became the common property of all civilized peoples, the

knowledge by men of the world and its phenomena extended in unexpected measure, observation and thought ~~were~~ directed to the great and the eminent. A flight into the elevated, wide and infinite, characterized the entire intellectual life of the time; it also gave to the creations of the artists the peculiarity of their effect.

The centre of gravity of art creation **lies** in architecture in the period of the Barocco style. By it was established the entire construction, the architectural treatment, and the decoration in the service of the great and rich internal and lighting effect. Thereby the Barocco bears the stamp of the great style, the effect by ~~the masses~~ on the whole as in all its members, of bold and passionate design of an increased expression, in comparison with the Renaissance. And therefore it abandoned the classical repose, which was given to the creations of the high and late Renaissance of the theorists; therefore the movement, at first in the lines of the cornice and detail forms, and finally even in the facade plane, became a characteristic base of its appearance. Likewise sculpture and painting were dominated in the same way by it. In its works is further manifested an expressed joy in a true ~~conception~~ and reproduction of natural impressions. We recognize therein, as well as in the choice and treatment of building sites and in the design of great show gardens, a parallel to the innateness and strength of natural design, by which the philosophy of that time (Bacon, Spinoza) was also permeated.

How very strongly the Barocco style corresponded to the ground temper of the time may be estimated, because it found the widest extension and became an **international world style**, in which more than in any other preceding art period appeared the national differences. Even in Italy, in the land of severe classical art, it predominated in such measure, that it quite substantially imparted their external impression to certain cities, like Rome, **Naples** and Turin. Thereby appeared such a harmony in the conception and form treatment, that not only the local peculiarities in great part lost their importance, but that also it did not seem longer necessary, to char-

characterize so the art style of the different masters, as we have done in describing the Renaissance. The leading artists frequently wandered from one place of employment to another, and they furnished designs for buildings at widely distant places.

In the evolution of the Barocco style we can follow several divisions, that fall in different countries and also in different times. The last stage is formed by the Rococo, which has about the same relation to the Barocco, as the flamboyant style to the Gothic (volume 2, page 105). Since this retains the proper structural members of the preceding period, and was satisfied in regard to the architectural treatment with the curvature of certain crowning members, but therefore celebrated its orgies, the Rococo still kept itself within the limits of the columnar orders, yet with the extension of the curvatures to the plan and composition, and with an extended development of the decoration and ornamentation to almost extremely forced result of the principles of the style held by Barocco ornamentation. The name "Rococo" is derived from "rocaille" (shell) for shell and grotto work, which plays a great part in its form world. The Rococo style had its proper native home in France; it there appears as one of the most brilliant expressions of the free and sportively coquettish caprices of the Gallic blood, while for Italy it comes into consideration in only slight measure, since there at the time of its appearance and extension men had already again returned to a severer conception inclined to classicism.

If also the Barocco and also the Rococo style everywhere allows the recognition of a certain uniformity, there cannot be asserted a complete unity of the art conception in the period dominated by them. In their entire course becomes apparent an opposition of artistic views in two separating directions, of which the mostly prevailing tendency stands for the free and unlimited play of the imagination, the other for a stricter order in architecture and in all art. From the free tendency proceeded the Barocco, from the severer the classicism, which fostered a close adherence to the antique and the nearly related late Renaissance of the theorists. Certainly

the classicism of the period expresses itself less as an uninfluenced expression of independent art design, than much more as a reaction against the extravagance of the Barocco and Rococo, as a return from the passionately animated lines to repose, from the luxuriant tumult of forms to simplicity and insipidity. The Barocco was supported on the one hand by the endeavors of Catholicism and of the countereformation, on the other by the requirements of the power of the absolute princes. Classicism was only cultivated partially by those and indeed in combination with the Barocco, but otherwise had in Protestantism its most favorable soil. The Barocco style therefore reached its richest development in Italy, south Germany, Belgium and Spain, and -- beside and with Classicism -- in France, regarded as a splendid and dignified representation of an absolute kingdom, while Classicism found most adherents in north Germany, Holland and England. But finally it was Classicism, that with the beginning of the second half of the 18th century in the South and the North won a complete victory over the Barocco and the Rococo.

1. Architecture in the period of the Barocco and the Rococo in Italy.

I. Historical evolution and style.

The earliest characteristics of the Barocco style are already found in the works of Michelangelo. The incomparable master of genius, who like none other before and after him, dominated all three principal arts, architecture, sculpture and painting, with equal certainty, and could draw them into the service of his high artistic problems, bore within himself all the peculiarities, that must compel him to a rapid abandonment of the strict art principles previously held. His overpowering personality, that sought to bury itself in the powerful pressure for creation, the preference for the powerful and the colossal, his unquiet spirit, that particularly expressed itself in a frequent dissatisfaction with his creations in statuary, and ever demanded new materials, his expressed sense for grand decorative effect, in this we recognize the ground lines of the Barocco style. Certainly this tendency in architecture first employed on the tomb chapel of the Med-

Medici in Florence (volume 2, page 221), begun in the year 1521, did not at first attain general further development. Indeed already about the middle of the Cinquecento it had exerted a determining influence on several in part very important buildings. But the contemporaries and direct successors of the masters, among them the most respected architects of that time, in the majority at least in the architectural treatment adhered to the required mode in the Italian high Renaissance for a refining of the forms in an antique spirit. Therefore the earliest beginnings of the Barocco style still occurring in the late Renaissance could not thrive in opposition to the tendency represented by the principal masters, particularly by Vignola and Palladio. But it is characteristic for the outbreak of Barocco ideas, that just the former of these two "strict lawgivers of architecture" was the one, who designed the ground plan of the church Gesù in Rome (volume 2, page 227), the typical Barocco church, that became a model for a number of others, and that his pupil Giacomo della Porta with the facade placed before it, became the founding and guiding master of Barocco art. To the influence of the severe classical tendency is it to be attributed, that many buildings of the Roman Barocco, that already show a very energetic striving for a grander treatment of the interior in the sense of the Barocco style, do not keep equal pace in the form treatment with the progress of the development of the style by retaining the more academic elevations of columnar architecture. Then the architecture of the theorists passed over into that of the Barocco style without a striking breach with the past about the year 1580. The starting point and most important scene of Italian Barocco architecture was at Rome. The eternal city was to again live through a new and splendid architectural period, even after its high ascent in the period of the Renaissance. The impulse to this was given by the revolution in ecclesiastical conditions, which resulted from the events occurring at that time north of the Alps. There the reformation had most deeply agitated the minds. The stormy movement aroused by it made its powerful wars felt in even Italy, and there led to a complete transformation of the

spirit of the time, which found expression in the counterreformation. Religious ideas filled the entire people as well as the leading spirits. So absolutely as only once before questions of faith stood in the foreground of all public interest. Bloody wars were waged all over Europe on their account.

It was unavoidable, that this again aroused religious spirit -- indeed a spirit, that would first of all express itself in the creed borne for show -- should obtain its strongest impulse and expression in the papal city, the latter chiefly in church architecture. This now proceeded to a new and magnificent development. It again became a leader in art, while the Renaissance in great part was developed on palace architecture, its forms then being transferred to church architecture. In church architecture was completed the entire development of the style of the Italian Barocco.

We can distinguish three periods in its course, that are characterized by the ascending development, the artistic climax and the decadence. The first period of the early Italian Barocco falls in the time from 1580 to 1633, i.e. to the installation of the high altar by Bernini, the great master of the Barocco, in the church of S. Peter at Rome (Fig. 23 and page 30), that in its time aroused great attention and had as a result an entire abandonment of the previously valid art laws. In this early period were developed the ground lines of the Barocco style with increasing distinctness and boldness; concentration of the architectural ideas on works of triumphant magnitude and splendor; unity of the architectural creation, both in respect to the treatment of the interior as well as to the architectural form; picturesquely animated grouping of the architectural masses and of the architectural members; wide and high spaciousness of construction; effective utilization of the contrast of light and shade; free and powerful handling of the forms, independent of the former architectural rules, with duplication and enlargement of the structural members (Figs. 1, 2); rich and splendid equipment with many-sided additions of sculpture and painting; the whole as an expression of the highest design and knowledge, calculated for the production of the most elevating and solemn

harmony. The principal masters of this period are:-- Giacomo della Porta, Domenico Fontana and Carlo Maderna. We shall describe their works later. They manifest a conscious abandonment of the track of the Renaissance and an ever increasing division therefrom, until the path passed over -- with the end of the first third of the 17 th century -- enters a course in which it reaches the extreme distance from that style.

Therewith begins the period of the flourishing Italian Barocco style, which is to be placed in the time from 1633 to 1700. It characterizes a gradually appearing and visible change in the conception of art, which stands in close connection with the changed views on the importance of the Renaissance and the relation of art to the church. Yet a few decades earlier were the smallest remains of the antique inspired, revered and esteemed. But now the respect and reverence for classical art had sunk like that of pagan antiquity, so that the architecture-loving Pope Sixtus V had antique buildings removed (among others the Septizonium of Severus; volume 1, page 139) and antique statues were removed from the public squares or replaced by Christian (for example on the triumphal columns of Trajan and of Marcus Aurelius). Men were also scarcely less intolerant to other preceding art. Numerous churches of the Early Christian period, the middle ages and the Renaissance, indeed even from the early Barocco period, were covered by stucco decoration corresponding to the taste of the time. We see in this in what high esteem this stood. But also in the general composition and in the architecture appeared important innovations. Men began to resolve the heavy structural masses, to enhance the picturesque in the interior by interesting perspective views, and in the form treatment by animated play of lines in the whole as in details, to enrich the decoration by all means, and well calculated perspective and lighting effects in the service of an extremely labored and even refined effect.

More than in the early Barocco again appears the individuality of the different artists. Thereby their works acquired an animated and personal character. Also the general representation of architecture changed its appearance. Since the

theorists had restricted architectural creation to fixed rules and forms, to definite dimensions and proportions, it received a dry, meaningless and frequently unfriendly character, particularly in the hands of less important architects. When Bernini, the great master of Barocco art, took up the plan and with scrupulous dignity broke the restraining fetters and gave life and movement to the petrified forms, such as corresponded to his own designs, the people exulted in him as inspired, and even the masters in the majority were overjoyed, that finally the bonds were broken, which for centuries had set limits to their free inspiration. In the works of Bernini, Barocco art shows its highest on those of his contemporary Borromini, who even sought to excel him, in its boldest works. It was Borromini, who set the entire walls, and particularly the facades, in oscillation and in the form treatment, following his passionate temperament, deviated farthest from the normal. (Fig. 3). The details, which were frequently neglected in the first period in view of the intended effect of the masses, were again treated with care, but in the endeavor for lightness and picturesque or strong effect of shadows, with the greatest possible use of animated curves in the framework, were transformed in the cornices and even in their profiles. With the two architects mentioned stands as equal a third, Pietro Berrettini, called da Cortona, chiefly employed as a painter, the founding creator of the showy ceiling decorations. He was followed by Andrea Pozzo, in whose astonishing ceiling paintings and equally splendid and costly internal decorations the love of show and the festal harmony of the Barocco time found its clearest expression. (Fig. 12).

The first and second periods of the Italian Barocco style had chiefly Rome and the immediate vicinity of the capital as their scene. It had aroused unusual attention, received the most animated approval, and in the last quarter of the 17th century commenced its spread into the remainder of Italy and beyond the Alps to the Austrian and German countries. But the successes of the before mentioned masters could only exceptionally inspire their own creations with that high artist-

artistic life, which is peculiar to the buildings of Bernini and Borromini. They adopted the series of forms and technics of the great masters, and indeed as usually the case for the spread of definite art tendencies, in the extremes and personally most distinctive types, thus chiefly those peculiarities in style, that are especially striking as innovations opposed to the Renaissance. Since Borromini went infinitely farther in this than Bernini, then just his buildings exerted a lasting influence on the architects and painters of nearly all Europe. Thereby came those thoughtless imitations and limitless exaggerations into being, by men not creating by their own gifts, that have brought the Barocco style into such bad repute. But so far as Italian architects were engaged, who now received great commissions from outside their country, they entirely followed the paths previously designated by the principal masters.

About the end of the 17 th century became perceptible an energetic reaction against the luxuriant style of Roman Barocco art. The tendency to extreme caprice introduced by the stupid successors of the principal masters in Italy, the native land of the Roman antiquity, where the grand structures from the classical earlier period yet stood before their eyes and challenged comparison, could not remain without strong opposition in time. The Barocco style also already about 1700 had passed the climax of its development; in the extravagant works of Borromini it reached the natural limits of its capacity for development. Meanwhile Rome had suffered loss in its position as a world power and thereby in its importance. The centre of political history lay in France, where the culture of art had taken a splendid advance under Louis XIV. From thence a severer conception influenced the chiefly concerned distinguished and dignified appearances, and through moderate leading masters Italian art again, particularly palace architecture, which adopted many suggestions from the high development of the French royal chateaus. Thereby after Borromini's later time came new support and increasing influence to the counter movement occurring in Rome with the aim of "purifying the degenerate architectural style", under which architecture

gradually passed into more quiet paths, into those of the third period of the late Italian Barocco style, which comprises about the time from 1700 to 1800. The *facades* (Figs. 5, 31, 32) were again in a plane; the structural members were brought into better graduated proportions and more carefully drawn, and likewise in the internal decoration taste experienced a corresponding purification. Yet the more important masters, particularly the specifically Roman among them, entirely retained the character and architectural aims of the Barocco of the best period, even if they loosely held the monumental effect by their excesses. The chief masters of the late period are Filippo Juvara, Alessandro Galilei, Niccolo Salvi and Luigi Vanvitelli.

The Barocco style corresponded so strongly to the national spirit of Italy, that the proper Rococo found no entrance, aside from a few examples shown in upper Italy. At the time when the Rococo of France spread over nearly all Europe, the Italian masters opposed to it monumental works, that belong to the grandest creations of Barocco art. First at about the middle of the 18th century the imagination, exhausted by the vast expenditures of power, resorted to the ideal of the native classical art, when it entered the path of Neoclassicism.

Since the ground forms of the Barocco style on the whole remain the same, we can consider them together. In church architecture the masters, in their endeavor to create undivided interiors as large as possible, could not at first free themselves from their preference for central buildings. Therefore in the first period the ground plan still formed the Greek cross, such as Michelangelo had designed for S. Peter's in Rome, the principal church of Christendom. With regard to the requirements brought forward with emphasis in the age of the counterreformation, that church buildings should restrict themselves more closely to the needs of Christian worship, and therefore give preference to the basilican ground form, a combination of the central structure with the nave soon became the rule. * To the main and transverse aisles were given as great width and height as possible, the side aisles being reduced, so that they received the character of corridors, or

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they were also sometimes entirely omitted or transformed into chapels of considerable width and but small depth. The transepts projected but slightly beyond the width of the nave. The nave received only a moderate extension on the main axis, in order to not injure the effect in the interior or that of the dome externally, indeed with three intervals between piers for the front arm and one between transverse aisle and apse. The choir terminates in a semicircular apse. For the plan in the form of the Latin cross with chapels at both sides of the main aisle, the Jesuit church in Rome had furnished the classic model (volume 2, page 227). It is the normal type of the church building of the Barocco period, and reappears in numerous churches, among others in almost unchanged form in S. Ignazio at Rome. (Fig. 6). The Greek cross was only employed for especially added show chapels. But men did not always adhere to the normal type. To heighten the internal effect and to increase the picturesque effect, the front arm of the cross was frequently extended between two piers like a transverse aisle. Through Borromini's rooms of round, semicircular and elliptical plan, circular terminations and even domes with oval ground plans came into use. The search for novelty finally produced the most varied combinations, but most mostly very skilfully calculated for the effect of the interior of the dome.

* *The extension of the church of S. Peter in Rome by the nave designed by Maderna commenced in the year 1607.*

The structure (Figs. 2, 4, 7, 9, 21, 22) strove for a majestic internal and external appearance of entire enclosure and unity, so that it expressed the strict Catholic principle of a strong accenting of the Christian idea of upward endeavor by rich vertical members (with continuous pilasters and columns with returned entablatures), the gathering and appearing of the forces in the mighty dome, lighting and decoration, which produced that solemn and reverent harmony, suited to the House of God. Structural difficulties opposed the use of columns in the interior, since for the desired intervals, these must be far too massive, in order to support the upper walls of the middle aisle and the vaults. Therefore columnar

churches only were exceptionally used until about the year 1600. The columns were sometimes coupled in pairs and furnished with an entablature block above the capital. The spacious wide and high construction required the erection of piers. Further subdivision as a rule with the great interspaces, one pilaster no longer sufficed, since it appeared as too weak. Therefore they were arranged in pairs beside each other or projected from a central main pilaster, on both sides of which adjoined receding half or quarter pilasters. Thereby resulted a doubling and repetition of surfaces as a clustered pier, whose profile was frequently continued in the transverse arches of the vaults. Half columns but seldom projected from the piers, since they reduced the unity of the interior and caused a too massive impression. Generally columns were still employed in the interiors of churches at the time of the developed Barocco only for the construction of wall altars, then being composed of real or imitative variegated marbles.

** In the Cattedrale of Bologna, the choir was built about 1575 by Domenico Tibaldi and still belongs to a late Renaissance. But the nave system (page 29) gives an excellent example of the developed Barocco style.*

To the rich subdivision of the piers corresponded an animated treatment of the walls by pilaster orders with blind arches turned between them and the addition of niches, that were arranged beside or over each other in various ways, frequently being enclosed and treated in a bombastic manner. The main cornice continues in an animated broken line around the internal walls, interrupted by many returns above the compound piers, as the upper termination of the vertical structural parts. Above it usually extends a comparatively high attic for increasing the height. Thereby the unity of the interior is preserved and more strongly accented. Above the attic rests a semicircular or depressed tunnel vault for spanning the middle and transverse aisles, intersected by the side vaults over the windows of the clearstory walls. The chapels are partly lower, so that galleries find space over them, but are also partly extended high.* Their covering is almost always effected by low domes or cross vaults without ribs. Where

galleries are arranged, above the arched openings to the chapels is added an intermediate cornice with a balustrade railing. In the later time the galleries frequently project as balconies in animated curves with railings curved outward. Great attention was paid to the imposing effect of the dome, which rises in a majestic vaulting line on the intermediate pendentives (volume 1, page 106), with a drum subdivided internally by pilasters and externally by half columns, and terminates in the lantern. In the construction and treatment of the dome and of its substructure substantially new solutions scarcely occur. The towers increase the picturesque general effect of the architectural group usually in the happiest manner, if they are simple and are kept within noble proportions and are not built on labored (oval or even with two sides curver outward and two curved inward) ground plans, according to the dangerous example of Borromini. With careful graduation according to the importance of the different rooms, the lighting is effected by small windows in the chapels or side aisles, by elevated ones in the middle and transverse aisles, over which transverse tunnel vaults (as cross compartments) intersect the main vault, and in the interior of the dome by the abundant admission of light by the circle of windows and the lantern.

** In the monastery and foundation churches of south Germany, frequently built under Italian influences, the chapels have nearly the height of the middle aisle.*

The facades (Figs. 1, 8, 20 b) are treated on the entrance end as purely show pieces, without taking particular care for the expression of the arrangement of the interior. Through Palladio the use of a single columnar order came to be adopted. But the predominating system is formed by two orders above each other, indeed in the early period chiefly by pilasters, in the later time by half or entirely projecting columns. The upper termination of the fronts of the side aisles (or chapels) against the building is by volutes, which are usually decorated by garlands of fruits and the like. Since the side aisles are narrower than in the Renaissance churches, the facades appear more unified and consistent. This facade

system is then developed in the most varied ways by the alteration of projecting and recessed wall strips, by pilasters and columns, windows and niches, and the form treatment. Borromini and his imitators then adopted the mentioned means of curved facades, when they allowed the middle portion with the entire architectural arrangement to project in curves and curved inward the side wall surfaces, or the reverse, or when they at last even took the wave form as a basis. Next to the main facade also the dome is richly treated. Otherwise the side facades remain simple, like the entire exterior; it is limited to a simple subdivision by pilasters and to a modest enclosure of the windows.

On the architectural treatment of the details, the determination of the composition for great internal, massive and decorative effect invariably exerted only a detrimental effect. Caprice in the treatment of the columnar or pilaster orders, the doubling of structural members by the insertion of half and quarter pilasters behind at both sides of the columns or main pilasters (it was desired to produce thereby also a perspective apparent recession of the wall panels), the corresponding repeated returns of the cornice permitted the disappearance of the refined feeling for a form treatment corresponding to the statical functions of the structural members. In favor of the richer effect of the cornices their members were also heaped, strong projections casting shadows were given to them, sharp undercuttings and free profiles in wavy lines. (Fig. 125). Yet in this the Italian masters did not go as far as did the Germans later. Even on the capitals were attempted novel forms, even if by an unlucky hand. The Ionic, Corinthian and Composite orders were preferred. On the capitals of the former the volutes, projecting under strong pressure, were combined with a series of leaves, whose tips hung down like tassels. The portals on the principal facade are comparatively small; by their entire subordination to the general effect and the insertion between them of the pilasters or columns dominating the facade, there remains but little space for their development. On the contrary, the middle portion is preferably so terminated by a gable by itself, that

it appears as a grand external enclosure of the principal portal. (Figs. 1, 8, 20 b, 29). At the sides, where the restricting conditions vanish, the entrance doorways are often emphasized and flanked by columns or pilasters. On the window enclosures the wavy profiles appear more strongly. the pleasure in animated and broken lines leads to the returns of the enclosing members at the angles, whereby the windows and also frequently the portal jambs receive the so-called ears, characteristic of the Barocco. (Fig. 13). Over the windows and portals the gabled and curved caps and ornaments play a great part. They were treated with animated curvatures, perforated, rolled, and even overloaded with sculptures and decorative ornamental work. In and above the portal caps place is found for statues of saints, figures of angels, papal, bishops' and other arms, emblems, crowns, halos and the like. The niches frequently receive a very showy enclosure, like the windows. They are mostly intended for the reception of statues of saints, but likewise serve for the subdivision and animation of the wall surfaces and for accenting definite parts. The upper ending of the interior of the niche is preferably by a radiating and carefully wrought shell, which thenceforth forms a favorite element of the ornamental forms. The consoles also reach a richer treatment and use; in any case one frequently misses in their proportions and form-treatment the development from the structural idea. Above the main cornice generally further rises an attic or balustrade gallery, whose piers seem continuations of the facade pilasters and serve as pedestals for figures of saints (in secular architecture for statues of historical or mythical personages, of obelisks, trophies, vases etc.); they give the building an effective crown and an animated outline. Aside from the especially preferred places, the ornamentation of the cornices, arcnivolts and the like was generally avoided, and likewise on the flutes of the shafts of pilasters and columns. An effect was rather sought by heaping the moulded members and the returns. Herein the conception of the Barocco period essentially differs from that of the late Roman antique, that on stately buildings covered the bases, architraves, friezes and cornices uniformly with sculptured work in interwoven bands, garlands.

of leaves, egg-and-dart mouldings, pearl beads, acanthus ornaments, rosettes and the like.

In the decoration of the interiors the seeking of the time for show found in the better works its most fluent, but mostly an aimless and loud expression. If already the architecture could scarcely afford satisfaction, then men knew no further restraints in relation to all that acted by light and shade, by form, color and gleam, and could astonish. Where the means could be obtained, the entire interior was covered and overloaded with relief and painted ornament, and with the splendor of color and the metallic lustre of costly materials, but with well calculated gradation according to the importance of the different architectural parts. In the chapels the development of the splendor was relatively restrained, but it was enhanced in the choir, on the altars and -- to draw the eyes upwards -- particularly on the vaults. The plinth, pilasters and cornice, frequently also the internal window enclosures and jambs, after the precedent of the Jesuit churches in Rome received facings of variegated marble in animated colors, and indeed for the plinth was preferably taken dark gray or black, for the main pilasters red below and black above with white veins, white for the capitals, the architraves and the main cornice. But to frieze were given white ornaments on a black or dark ground of marble. If possible the walls of the choir and frequently also certain favored chapels were faced with yellow or variegated marble. For sepulchral or passion chapels was then preferably chosen black or dark gray marble in alternation with yellowish white. Where the genuine material could not be obtained or the means did not suffice for it, it was imitated in stucco, to which was given the appearance of the noble stone by a mixture of bits of stone of different colors, by rubbing and polishing -- the workmen attained great skill therein. Beside this obtrusive magnificence relief ornament could only be satisfactory in the boldest form. Statues of saints in animated movement and in ecstatic postures, with garments appearing to flutter in the storm wind, figures of chubby little angels, both in the round and in dry relief, allegorical ideal figures fill the niches and adorn the tops of gables, scendrels of arches, keysto-

keystones and attics, the altars, pulpits, holy water stoups and the like. In the naturalism of the forms and the representation of the affectedness in the beards and the expression of the faces, things worthy of recognition were undertaken by the most important masters; by the lesser artists and the arrangement of the masses, that almost form the rule,* (see page above), the sculptures have merely a decorative value. The execution was on the altars, pulpits and the like, in marble, stucco and in wood, in the latter case with painting in colors and partial gilding, but on the walls almost exclusively in stucco. In a similar manner was treated the ornamental decoration, which was distributed in lavish abundance over the entire interior, in white, or gilded and also partly painted in colors. As motives for this are particularly characteristic for Barocco the cartouches (swelled enamel shields enclosed by bombastic scrolls; Fig. 10, top; Fig. 13, the shields over the portals), shells, heavy garlands of leaves and fruits, acanthus bells, leaves and scrolls of "conventional swelled forms" were employed. In the later time the ornamental work assumes a soft character derived from stucco technique, as if it was modeled from a doughy mass with a particular preference for shell forms in a hasty and freehand commission. The richest development was attained by the framework as enclosures of paintings and figure reliefs, or also as independent structure or decorative forms for the subdivision and animation of the wall surfaces. The frames are at first rectangular with returns, roundings or recessions at the angles, but later move in curves with outlines ever increasing in movement. In their often very charming decoration by foliage and shell work, they belong to the most profitable and expressive innovations of the Barocco style. The last stage of their development is visible in the style of decoration represented in Fig. 16. Decorative painting secured in the ceiling paintings the most appropriate field for showy development of its charms, and this was utilized in an extremely labored manner. Therefore even more than the other arts were they under the domination of Barocco principles. In the period of the Renaissance, figure representations on the ceilings were

mostly restricted to the domes and the half domes. For the remaining vault surfaces were then employed coffers or ornamentation. The Barocco resolved these surfaces into panels, that always became larger, for the benefit of allegorical, historical or mythological representations. Finally it took the entire vault for a painting, and left it to the stucco-worker to create for its works a suitable enclosure with supporting and filling figures, cartouches, garlands of fruits and ornaments. There originated the great ceiling paintings, that were properly adapted to embrace as much as possible the feeling of spaciousness in the interior and the sensation as if the interior were closed at the top. (Fig. 11). It was opened by a view of the sky and its occupants soaring on cloud forms, and to strengthen the illusion, painted on extremely naturalistic views on the underside, figures appearing in life size, which were grouped around the edge behind balustrades etc. in festal costume, moving on splendid architectural structures, which are so equipped as if one were in the court of an ideal palace with the eyes directed upward. In order to make the deception perfect, men even went so far in the 18th century as to pass from painting to sculpture, i.e. draperies and figures in relief in stucco at the extreme edge with scarcely perceptible joinings, so that portions of the clothing, legs and arms etc. hang over the enclosing frame, and even entire figures in relief project from it. Men were even no longer satisfied with that. Certain masters hit on the startling idea of further deception by the contrast between the dim light of the interior of the church and the full daylight, when they actually perforated the vaults of the church by openings outlined in the Barocco style, and indeed on a second vault built over them and brightly illumined by side lights, painted the sky and clouds, soaring angelic figures and divine personages. -- We regard such a trick in art as a cunning act, that only appears intelligible to us by representing the aims of the time as directed toward theatrical pomp. In the crowning of the high altar, the halos based on a similar effect and with God's eye have much more the appearance of justification. The internal equipment attains its climax on the altars. They are colossal arrangements of columns, t

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that either enclose the altar table, or in case they are free, as a canopy. (The most famous example of this is the altar of S. Ignatius in the Jesuit church at Rome, the most venturesome and worst in its results being Bernini's high altar of S. Peter's church there. Figs. 12, 23). Likewise the pulpits, doorways and the cabinet work of the churches exhibit reduced transfers of the architectural forms developed on the walls.

The monasteries of the Barocco period in general retain their traditional plan. Yet the cloisters visibly lose their former importance and afford interest only in particular cases, if they are treated as arcade porticos on columns. On the contrary the chapter halls, refectories, sacristies and stairways in the monasteries of the more powerful Orders mostly exhibit the Barocco style in its most expensive and dignified magnificence.

Certain Orders, and indeed such as have to maintain no divine service of the community, reject colored decorations of their House of God, aside from the altars; they leave the walls white. Just in these churches but slightly decorated in color does the Barocco architectural and form system exhibit its most favorable side; here may it be seen, that the endeavor of the Barocco style for breadth and high spaciousness with construction and for a freer and more powerful treatment of forms in the spirit of its time are shown the highest works.

Palace architecture first strives to provide for the court and for the monarch as large, wide and high apartments with the most impressive and convenient arrangement, designed to receive a distinguished society and to afford subordinate rooms suitable for the servants, in proper connection with the principal apartments. The courtyards become less important; particularly in Rome and middle Italy, they are preferably enclosed by walls alone or receive an open loggia on but one side. but in upper Italy by a certain preference the courts with porticos are retained. There are found very impressive columnar courts, while elsewhere when open courts were desired, the arcade structure rests on piers as a rule. In the arrangement of the ground plan may be recognized an inclination to a greater extension in length with a corresponding re-

reduction of the depth of the building, in order to produce an imposing effect by a vast principal facade. In the grouping of the rooms opportunity was taken particularly for a tasteful arrangement of the main portal, vestibule, stairway and main hall. Several points determined these, by which the Genoese architects of the late Barocco already allowed themselves to be guided. (Volume 2. Page 232). The facades (Fig. 13) form a continuous straight line, without wings at the angles and also chiefly without a projecting middle building. They are restrained in the first period within modest limits (in contrast to the contemporary church architecture, which by the striking enlargement of the cornices and by heaping the pilasters and columns, men sought to awaken the idea of earnestness and of reverence in presence of the House of God. The stories thenceforth are no longer treated as of equal value, but one of them is especially emphasized as the principal story, particularly the middle one, by a greater development in height and a bolder enclosure of the windows. The lowest story frequently merely forms a high plinth for the building, on which rests the subdivision by pilasters as a "colossal order". But in general predominate facades without a subdivision by pilasters. The required great windows of the principal story and the smaller ones, particularly those of the intermediate story, do not fit well into their system without restrictions or irregularities in the subdivision of the surfaces. To the windows was given a correspondingly bolder and richer treatment, especially with capriciously curved caps. Instead of the pilasters, vertical wall strips frequently appeared after the 17th century, which in combination with horizontal bands effect a subdivision of the wall surfaces into sunken panels. The actual show pieces of the facades are the portals. By the rich sculptured ornament and by the atlantes or hermes often employed there, which give the expression of the most luxuriant exercise of force, and in connection with the balconies supported by them, they form architectural pieces of most effective magnificence. On the whole the facades also follow the principle of an entire unity of artistic creation; particularly in the very much preferred ex-

execution in plaster and stucco, they appear as a homogeneous mass with a relief character. They still retain in the second and third periods, also with greater expenditure in decorative expedients, as a rule a cold, dignified and often repellent restraint. We have in this a reflection of that grandiose character, which under Spanish influences then dominated transitional forms of distinguished society. Only the garden facade, as belonging to the more intimate portions of the house, exhibits a richer subdivision and treatment. The greatest splendor was developed in the handling of the interiors. Through the main portal is first entered the vestibule. It is generally an imposing open portico with picturesque views of a fountain erected at the opposite wall of the court or of an ornamental architectural structure with a real or painted distant view of the landscape. From the vestibule a grand stairway leads to the principal story. In a particularly monumental design, this has a broad middle flight with low risers to a landing, and from there by two branches at the sides extending backwards. If the stairs also extended to the upper story, they were mostly arranged in the form of an extended hall with the stairway flights arranged along its walls. From the stairs one either passes directly or through an ante-room into the principal or festal hall. This is placed on the middle axis with a shape approximating a square. At both its sides are placed the apartments for the masters. The ground plan of the principal story, as a rule in the 17th century, further receives a long and narrow hall, the gallery (galleria), which (according to Scamozzi's statement) was adopted by the French chateaus. In the grand style these were furnished with orders of columns or pilasters and ceiling vaults, and in the developed Barocco, they form the most magnificent interior of the palace. (fig. 15). Until about the middle of the 17th century, the halls have horizontal carved and painted or gilded wooden ceilings, but are later covered in the form of low vaults, chiefly constructed with wooden surfaces covered with plaster for the reception of fresco ceiling paintings. On the walls of the great halls predominates the purely architectural subdivision of the walls by columns

pilasters (Figs. 15, 16). In the smaller rooms during the first period the walls exhibit below the ceiling a deep frieze adorned by figure or landscape paintings, under this being a paneling or hangings of decorated leather, fabrics or of printed papers (in the subordinate rooms). The principal wall with the mantle receives a larger fresco painting over this. The walls were later entirely covered with hangings or even more rarely were covered by painted representations in perspective. Concerning the treatment of the cabinet work, the relief and painted decoration and ornament, what has already been said on pages 16 to 20 is applicable.

The remaining secular architecture matures no new and peculiar architectural designs, aside from the theatres; but it is completely dominated by the Barocco in composition, the striving for spaciousness, for the most convenient arrangement of rooms possible, for impressive treatment externally and internally, and particularly in the entire treatment of the forms and the decoration. The manner in which this permeates the entire art and industrial creation from the height of the life of the court down to the simple peasant's room and its equipment, and it is characteristic of the intensive and innate life power in it. Public buildings, that had to provide for assemblages, such as city halls, universities and the like, preferably adopted from palace architecture as models the vestibules, the grand stairway and the great hall. Villa architecture, which attained its climax in the time of the Barocco style, most closely adhered to these. It developed more in width than in height and depth in its design, since it was less restricted to a limited ground area. In the interior are frequently found state halls with the most splendid treatment, favored by the free light on all sides. The front facades (Fig. 18) are mostly simple, often severe and repellent, but richly treated on the garden side. The garden style reached a stately development. It retained the principles already developed in the 16th century by the Renaissance (volume m, page 200), but passed wholly into grandeur while retaining severe architectural lines, designed for prespective effect. The water courses and walks were always laid out in straight lines, the former often extended into basins, the latter acc-

accompanied by dense hedges of cypresses or covered by evergreen foliage as if vaulted, with openings for views of the distance, of grottos, fountains, ornamental architectural structures or works of sculpture having a definite mythological significance. The frequent grading of the soil into terraces afforded opportunity for the design of ramps with balustrade railings, for cascades, flights of steps, semicircular enclosures (the so-called theatres) and the like. To these state gardens was assigned extraordinary importance in the Barocco period. In them was fulfilled not only the most important requirements of a quiet stay in the country, but also in the harmony between villa and garden, as well as in the contrast between the free and uncultured nature and the presence of the nobles were effects of the choicest charm. (Fig. 17).

The well conceived composition of the architectural works in the landscape and surroundings with regard to the most tasteful external effect possible led to a very careful selection of the site, and in cities to a monumental treatment of the square. For this especially served the public fountains, grand flights of steps (Fig. 19), memorials and gateways, which both as show buildings like triumphal arches as well as portals of parks and even for small gardens and squares, received a very fanciful and imposing treatment. (Fig. 27).

Theatre architecture experienced an advance in the Barocco period. To the audience space were given rising seats, in the arrangement of a horseshoe with the open side toward the stage, its rear being enclosed by a two story arcade portico. The rows of seats surrounded a great parquet before which was placed the stage. Instead of the solid walls of the stage was an architecturally treated structure, through whose great openings could be seen the acts played on the stage. The rear porticos were finally developed into boxes and galleries, the rows of seats and the stage floor were inclined, and the stage was furnished with traps, side and top scenes, thus having the type of most modern theatres.

II. Most Important Monuments.

PERIOD OF THE EARLY ITALIAN BAROCCO STYLE. The first and the path-breaking master of the Barocco style was the already

mentioned Giacomo della Porta. His basal creation is the facade of the Jesuit church in Rome. (Fig. 8). Vignola had divided the facade into three parts in his ~~unexecuted~~ design, a wide middle building and two side portions only attached to it (as fronts of the rows of chapels accompanying the middle aisle), treated with simple pilasters or columns with unequal intervals, with the addition of doors or windows alternating with niches in the intermediate spaces. Giacomo della Porta created a complete unity of the facade by including the fronts of the side aisles in the general form and terminated them at top by energetically curved volutes closely joined to the middle part. He doubled the pilasters and accented the vertical subdivisions by repeatedly returning the cornice. The relief ornamentation was substantially simplified; the niches intended by Vignola in the three outer intervals were entirely omitted, but the cornices and structural members were correspondingly enlarged; accenting the separate wall panels by enclosures was avoided. Thus originated an architectural mass, clear in its organism and properly subdivided, with unified and complete character. Porta's activity as the constructing architect of the dome of S. Peter's has been already judged. (Volume 2). Of his palaces, palace Palazzi in Rome is distinguished by beautiful proportions still closely adhering to the Renaissance. The villa Aldobrandini near Frascati (about 1600) already bears in the massiveness of the members the lines of the developed Barocco.

A severer tendency in the sense of the late Renaissance was followed by Martino Lunghi the Elder in his palace Borghese (after 1590), which encloses a splendid arcaded court with coupled columns. Of his two church facades, Chiesa Nuova adheres to the model given by the church of the Jesuits, while S. Atanasio dei Greci betrays influences from upper Italy (the native land of the master).

The architects of the art-loving Pope Sixtus V, Domenico Fontana (1543-1607) and his brother Giovanni (1540-1614) more strongly expressed themselves within the limits of an academic classicism. From the former comes the chapel of Sixtus V, entirely arranged as a central building above a Greek cross,

as if forming a right transept to S. Maria Maggiore, (begun 1584) and palace Lateran (begun 1584) recalling palace Farnese. He was also architect of the church S. Peter and as such executed the crowning lantern. Under Sixtus V the antique aqueducts were also partially restored, and the colossal obelisks were erected before S. Peter's, S. Maggiore and the Lateran.

2. About the end of the 16th century occurred a revolution in Rome, that allowed Domenico Fontana to leave the eternal city and go to Naples. He erected there (after 1600) palace Reale, planned in vast dimensions, but tasteless and greatly restored after the fire of 1837.

In Roman architecture the free and advanced Barocco won supremacy over the academic tendency. Domenico's pupil and nephew Carlo Maderno (1556-1629) then became the authoritative Roman architect of his time. His early work was the facade erected (about 1601) for the basilica of S. Susanna in Rome (Fig. 1), extending back into the Early Christian period, and it has an entirely Barocco treatment. About the same time he undertook the completion of S. Andrea della Valle, begun by Paolo Olivieri in 1594, who died early, and which in plan closely adheres to the church of the Jesuits, producing a very dignified impression in the interior by its spaciousness and the noble decoration, though still restrained. In the year 1604 Maderno was appointed architect of S. Peter's church. To him fell a problem fatal to the noble effect of the central building, both in regard to its interior as to its external appearance; he was directed to add a nave before the central structure in order to carry out the decision made by Paul V in the year 1605 (volume 2, page 217). Maderno gave to the nave three bays of less depth and endeavored as far as possible to lessen the unavoidable injury to the form of the interior, when he enlarged the side chapels toward the dome and sought to improve the domed area by a favorable lighting. But this was but partially successful. Actually one obtains in the church of S. Peter an entirely satisfactory appreciation of the interior, corresponding to the vast dimensions, the boldness of construction and harmony of the proportions,

first at that place in the nave at which the building of Michelangelo commences. In the plan of the vestibule, which is placed before the entire width of the nave, he returned to early Christian ideas. He treated the facade as a broad front with a colossal order of Corinthian columns and pilasters, a central and slightly projecting pediment, a high attic above, crowned by statues between two ornamental gables over the receding portions at the two ends. The facade represents a colossal ornamental piece of architecture, which appears disconnected from all relation to the building and particularly to its dome. Otherwise Maderna had at command considerable artistic ability in the development of the interior. His internal architecture of the vestibule of S. Peter's (Fig. 21) is counted with the most beautiful creations of this kind in all Rome. Of the palace buildings of Maderna is to be mentioned the beautiful court of palace Chigi (now Odescalchi on Piazza S. Apostoli), that recalls the courts of the palaces of the high Renaissance in upper Italy, and palace Barberini (after 1624), where the master drops the traditional plan, omits the internal court and -- indeed to obtain a richer picturesque effect -- connects two parallel wings by a middle building. (This building was executed by Bernini and Borromini, page 33). In the series of architects of the first period of the Roman Barocco style also appears the famous painter Domenichino (1158-1841) with the design for the grand church of S. Ignazio (1628) in Rome, in which he adheres to the conception previously held by Vignola and Porta. In the ground plan of this church are repeated the lines of the plan of the Church of the Jesuits (Gesu), aside from quite unimportant variations. (Fig. 3).

The remainder of Italy participated in the development of Barocco art during this period to but a very limited extent. In Florence the basal tendency held by the masters of the late Renaissance did not essentially change under their direct successors, although in details Barocco elements were adopted in increasing measure. Bernardo Buontalenti (1538-1603) went farthest in this, who capriciously broke and altered the pediment and introduced in the decorations accessories of all k

kinds, (fabrics, skins of animals, and especially grotesques in wonderful forms). He built several palaces and a larger number of villas near Florence, in which the chief emphasis is placed on the picturesque landscape. Likewise he gave to theatre architecture the now prevailing form of the space for spectators and for the stage.

Yet more than in Florence the spirit of the late Renaissance remained effective in upper Italy, indeed not only in the noble columnar courts of the palaces, splendid examples of which exist in Milan, Cremona, Bologna and Brescia, but likewise in church architecture. The latter exhibits in the cathedral of S. Pietro in Bologna (1605) by Father Magenta a grand and noble work on the nave system (Fig. 7), and in the new cathedral at Brescia (1604) by G. Lantana, a magnificent central structure.

In Genoa the previously mentioned palace of the University (volume 2, page 234) by Bartolommeo Bianco and palace Balbi-Soneregga, designed by the same master in 1632, belong in time to the first Barocco period, also among church buildings, the pompous Jesuit church of S. Ambrogio (1589), on which are to be recognized influences from S. Maria de Garignano, as well as the two columnar basilicas -- Genoese art here shows particularly its preference for columnar construction -- S. Annunziata, designed in 1587 by Giacomo della Porta, and the church of Madonna della Vigne (1588), in which two columns are coupled by entablature blocks, both churches having great axial distances and extremely splendid decorations. (Fig. 22).

In Venice Alessandro Vittoria (1525-1608) in his beautiful palace Balbi (1588) represents the conception of his master Sansovino, while the previously mentioned Vincenzo Scamozzi (volume 2, page 222), a many-sided and much employed architect, in his numerous works closely adheres to the conceptions of his great master Palladio.

In southern Italy no important architectural activity appears in the period under consideration. As a work meriting examination may pass in any case the church of Gesu nuovo in N. Naples. (1584) by Pietro Proveto, a central design with elongated cross arms lying on the main axis; its showy internal d

decoration is from a later time.

The SECOND EPOCH OF THE BEST PERIOD (see General, page 7) took its start in Rome from an early work of the talented Lorenzo Bernini (1598-1680), a Florentine born in Naples, who first a sculptor, then turned to architecture and finally was engaged in painting. This work is the altar canopy beneath the dome in the church of S. Peter at Rome (1633). In it the master undertook a nearly complete breach with the traditions previously in force. He placed on a high marble base four colossal bronze columns with twisted and luxuriantly decorated shafts, crowned it by an entablature rising freely from the composite capitals, returned and curved inward on the axes, heavy with draperies (executed in relief), above which rise upwards four massive volutes and combine above the centre as the supports of a crowning terminal member. (Fig. 23). Here architecture, sculpture and painting are most intimately combined harmoniously in an extremely Baroque expression. Bernini has indeed given therein a fatal example for the further development of architecture and decoration, to which may be referred the responsibility for numberless aberrations of his successors. With a true storm of inspiration was this work taken up by contemporaries. In his further works Bernini again returned to quiet paths, and in not a few of them manifested a striking and astonishing feeling for monumental treatment in general, as well as for a charming development of the architectural and ornamental details. With the angle towers above the main facade of the church of S. Peter, projected by him, which according to his ideas had too little height in proportion to its width, he did not have a fortunate hand. He was compelled to take down again the already constructed tower by the sinking of the foundations. The main facade of S. Peter's is thereby free from additions, which would only have been injurious to its effect. On the other hand Bernini secured undying fame by the treatment of the Place before S. Peter's (completed in 1667). With an indeed refined calculation of the perspective, he understood how to enhance the impression of Maderna's facade. He first arranged the ground before the church in a gentle inclination upwards, and

he placed colossal steps extending the entire width of the Place with low risers; then he added to the facade at each side low wings, converging somewhat towards the fronts, with strongly accented horizontal divisions (in order to allow the contrast to appear stronger between these and the facade), and finally he enlarged the internal forecourt so produced it into a colossal external court of elliptical plan, which he enclosed by the famous colonnades (Fig. 24), consisting of 284 travertine Doric columns with entablature and balustrade. A masterpiece similar in style was then completed by Bernini in the Scala Regia, an imposing stairway with picturesque perspective of columns and magnificent internal decoration leading to the chapel of the Vatican. (Fig. 25). His church della Assunzione at Ariccia (1664) and of S. Andrea in Quirinale at Rome (1678) are impressive central buildings of plain and dignified form. In secular architecture palace Cdescalobi at Rome is his chief work. (Fig. 13). The system of the middle projection of his facades with a colossal order of pilasters extending through two stories and standing on a high lower story, treated as a base, became a prototype for the entire succeeding period. Bernini was the most esteemed artist of his age (page 88). Even more in sculpture than in architecture, he pointed out the way for a full century.

The second great master of the best period, Francesco Borromini (1599-1667; page 8), at first colleague and later a strong competitor of Bernini, developed further the previously originated forms in the most consistent manner. His entirely picturesque and harmonious basal feeling, that should exhibit the structural members even at the first glance in the diagonal position, most favorable according to him, as well as in the endeavor to present interesting and capriciously animated architectural works even in narrow streets, induced him to introduce into architecture the curved surfaces of facades, broken pediments, scrolled cornices and cartouches in peculiar applications. In the ground plans of his churches he preferred the central building in a certainly very free transformation. With the little church of S. Carlo alle Quattro Fontane (1640-1667) he first laid down his artistic programme in

a startling manner. Then followed the likewise curved facade of the oratory of S. Filippo Neri (about 1650), also striking by the novel and capricious enclosures of the windows, the domed chapel of S. Ivo (Fig. 26) in the court of the Sapienza (University), and the tower of S. Andrea delle Fratte in Rome (Fig. 3); the two last works displaying the extreme consequences of his style principles. It was Borromini, who furnished the long venerated church of S. John Lateran in Rome with Baroque internal decoration, thus creating a precedent in such a prominent place (the Lateran church is the cathedral of the bishop of Rome), that was a fatal one for numberless churches. In secular architecture he was chiefly engaged in restorations (on palace Spada, palace Falconieri etc. in Rome). In Frascati he built the important villa Falconieri, which he restrained within quiet forms. (Fig. 18). On palace Barberini in Rome, begun by Maderna, Borromini at first worked together with Bernini. The former constructed the beautiful oval main stairway with a well opening supported by doubled columns. The facade was indeed the most important of the 17th century in Rome (Fig. 27) and was assigned to Bernini. Borromini took this as a rebuff, which led to a violent enmity toward Bernini, that finally ended in the suicide of Borromini. Like Bernini he was a highly gifted master, who understood how to impart a powerful artistic individuality to his works in spite of all extravagancies. With these masters the famous Florentine painter Pietro Verrettini worked on palace Barberini, called Cortona (1598-1669), who as the influential creator of magnificent ceiling decorations is placed in the series of the chief masters of the Baroque, but who likewise as architect exercised an activity in Rome meriting consideration, of which famous evidence is given by the very tasteful facades of the churches of S. Luca e Martino on the Forum (1640) and of S. Maria della Pace. With the Roman architects of the best period is yet to be mentioned the also very important Carlo Rainaldi (1611-1681). His church of S. Agnese on the Piazza Navona (begun 1651) is a domed structure over a Greek cross. Its very imposing facade has two flanking towers, between which the middle portion recedes in a curve. The animat-

animated architectural lines give an extremely expressive architectural form to the great square, which occupies the site and form of the antique circus of Domitian. (Fig. 28). Also for the church of S. Maria in Campitelli (1685) Rainaldi chose the central plan, yet with a transformation of the scheme in the manner, that it allowed the Greek cross to be followed by a domed area with a choir apse. The interior affords a great perspective charm. The facade bears rich ornamentation on projecting columns with strongly projecting returned entablature, and likewise the facade of S. Andrea della Valle (page 27), designed about the same time. Rainaldi was also the creator of the two small but nobly treated domed churches at both sides of the Corso on the Piazza del Popolo. In the second period of the Barocco styles also falls the greater part of the activity of the Jesuit Father Andrea Pozzo from Trient (1642-1707), probably an Italianized German named Brunner) as painter and interior architect. This was an extraordinarily fertile master, who in his sham architecture painted with astonishing accuracy reached the climax of Barocco ornamentation intended to enhance the feeling of spaciousness of the interior. His characteristic work of this kind is the fresco on the ceiling in the church of S. Ignazio at Rome (1670). But Pozzo also attained high fame by his splendid altars executed in the most costly materials, particularly by the altar of S. Ignatius Loyola, the founder of the Jesuit Order, in the church Gesù at Rome. (Fig. 12). He was the grand master of perspective, on which he wrote a valuable manual, and he also designed architectural monuments, but which were never executed. * The school of Pozzo was continued by the artist family of Bibiena, originating at Bologna. The Bibienas still belong to the second period; but their climax falls after 1700. Their most important member was Fernando Galli Bibiena (1657-1743). They were the chief masters of theatre decoration, and as such, as also by the design and execution of theatre buildings, carried on an abundant activity for a century, both in Italy as well as in Germany.

* In one of these designs occur the very daring "sitting" columns, with which one occasionally meets as pilasters in

stucco decorations in south German churches. They are employed in places where the height is lacking for modelling in relief a full pilaster. Then the upper part of the shaft appears as if slid into the lower portion; the junction is then marked by springing acanthus leaves. (Fig. 113).

Outside Rome and its immediate vicinity the Baroque style in its second period only occasionally came to an independent development. In Florence the great painter Pietro da Cortona, with whom we have already become acquainted as an architect in Rome (page 33), and others in the decorations of the halls of palace Pitti (1640), in which the surfaces of the walls and particularly of the ceilings have heavy and extremely ostentatious stucco enclosing borders, adorned by ornaments, shell work and the like, and animated by rich figure sculptures, divided in panels with splendidly colored paintings, gave the ideal of an imposing festal and ostentatious interior decoration. The direct successors of himself and of Buontalenti (page 29) endeavored to follow a middle line for their buildings between the Florentine and the Roman palace architecture. Genoa retains in the works of the much employed Bartolomeo Bianco (volume 2, page 234) the character belonging to the preceding period, yet closely adhering to the architecture of the Genoese late Renaissance. In Milan F. M. Ricchini, though still chiefly classical in design, led the late Renaissance into the Barocco. His principal work is the grand new building of palace di Brera (1651), whose imposing columnar court is counted with the most beautiful of the 17th century. The same tendency is pursued by certain not unimportant masters in Bologna. In Venice the architecture of this period passes through a splendid advance by means of the richly endowed Baldassare Longhena (1604-1682). In his works is expressed a very happy combination of the preference peculiar to the Venetians for ostentatious ornamentation with a refined feeling for powerful architectural treatment. His palace Pesaro (about 1650) repeats on one lower story of diamond paneled ashlar in two stories the motive of Sansovino from the library of S. Marco. It is reckoned among the most imposing palaces of Italy. On palace Rezzonico (1680) he placed Doric

columns before the rusticated ground story, so that all three orders were employed in the usual sequence. His principal work is the wonderful church of S. Maria della Salute (1631-1687), located at the entrance of the Grand Canal. It is an octagonal central building with outer aisle. The drum rests on eight massive Composite piers; the side thrust of the dome is transferred to the external walls by elastically curved volutes, for which the projecting chapels serve as abutments. To this central building of entirely novel design is mainly attached opposite the portal the proper altar space, certainly with little organic connection. The impression of the church from the canal is unusually grand. (Fig. 30). Longhena's works are scarcely inferior to those of Bernini in originality and artistic importance; yet Longhena restricts himself far more within the limits of a nobly conceived Renaissance than does Bernini. The example given by him had a determining influence on the later Venetian architecture. In Turin the temperamental Theatine monk Guarino Guarini of Modena (1624-1683) entirely enrolled among the followers of Borromini, without inspiring his buildings with that artistic life, that is characteristic of those of Borromini. He erected in Turin several churches and palaces, among which the vast palace Carignano (1686) represents his chief work. He was likewise employed in Sicily. In the church of S. Gregorio erected by him at Messina, he gives one of the most daring examples of Barocco caprice. The other churches of Sicily in most cases were influenced by the Roman columnar churches, and were furnished with the most luxuriant marble facings, richest in color (S. Domenico in Palermo). Naples had in Cosimo Fanzaga (1581-1678) its principal master of the Barocco period. His architecture adheres to the Roman school of Borromini, yet also permits the recognition of Gencese influence. Like all Neapolitan churches, with reference to the frequent earthquakes, his churches have low domes; the interiors exhibit a lavish and ostentatious treatment (S. Martino; Fig. 9).

The PERIOD OF THE LATE ITALIAN BAROCCO STYLE (see General, page 10) had to record its first grand works just when the architectural ideas of one of the most scrupulous masters of

the preceding period were transformed into facts in Turin. There the important Filippo Juvara (1665-1735) established the Superga (1616-1631) on a hill about 2 1/2 miles outside the city, a monastery design with a church having a highly monumental effect. (Fig. 31). The church is built at the end of an enclosed rectangle as a central building with a majestic and severely classical Corinthian portico, an imposing dome imitated from the church of S. Peter, and two flanking towers on the wings terminating the court side. On palace M Madama in Turin (Fig. 5) he created the beautiful western facade executed in marble and the magnificent double stairway. (1718). His chateau Stupinigi allows the recognition of French influences in the ground plan. * The tendency struck out by Juvara was continued by L. Vanvitelli (1700-1773), a son of the Netherlands born in Naples, who yielded still more than the former to French influences, and who aimed to establish in the colossal palace at Caserta (1752 begun), built for the king of Naples, a princely residence with the magnitude and splendor of the palace at Versailles. The immense facade is 830.1 ft. long, but it has a comparatively tasteless effect; yet the stairway (Fig. 14) is indeed excelled by no other in regard to grandeur of design, importance and richness of treatment. Very interesting is the theatre of this palace; it has in its plan and treatment entirely the form of the modern theatre building. In Rome the Spanish Stairs were built in 1721-1725 by Alessandro Specchi and Francisco de'Sancti, rising from the Piazza di Spagna to the church of S. Trinita de Monti (Fig. 19), and still proceed chiefly from the basal feeling of the flourishing Barocco style. The same may be said of the famous Fontana de Trevi (begun 1735), on which Niccolo Salvi (1699-1751) in a brilliant manner represented the "rushing triumphal entry of the water" into the eternal city in a picturesquely composed festal architectural work, richly adorned by sculptures and refined by classical treatment of the details. Visibly further advanced in the direction of a severe academic conception of architecture was Alessandro Galilei from Florence (1691-1737), who before his activity in Rome was long in England, where the Palladian class-

classicism had struck deep root. The facade of the old Lateran basilica erected by him (after 1734) exhibits the system also chosen by Madama for S. Peter's church, of a great Roman order with an attic crowned by statues, but in a far more impressive form. On the somewhat later facade of the basilica of S. Maria Maggiore (1743) Ferdinando Fuga (1699-1780) employed two orders with portico and picturesque loggias, which however lack purity of detail forms. On the court of palace della Consulta near the Quirinal (1739) Fuga also added one of these sham extensions in the principal axis, such as were so frequently attempted in the preceding period. As the last important work of the expressed Barocco style is to be mentioned villa Albani (after 1758), world famous for its art treasures, by Carlo Marchione, a grand and very imposing design, such as are but seldom found on Italian soil. (Fig. 33). The garden facade opens in the ground story in continuous pier and arcades with rusticated pilasters, which are flanked by Ionic columns as supporters of the archivolt. Among the buildings originating in Venice in the first half of the 18th century palace Corner della Regina and the splendidly treated Jesuit church (Fig. 4) by Erenichino Rossi yet occupy a place worthy of consideration. According to their artistic character they remain in the school of Longhena. -- Other masters of the Italian Barocco style we shall know later in considering the works erected by them beyond the Alps.

* Gurlitt assumes, that the French master Germain Boffrand (pages 78, 101) exerted a determining influence upon the treatment of the ground plan of chateau Stupinigi. (Gurlitt, *Geschichte des Barockstils, des Rokoko und des Classicismus in Belgien, Holland, Frankreich und England*. Page 270).

2. Architecture in the Period of the Barocco Style in Spain and Portugal.

I. General Basis.

In the 17th century Spain lost its high position in great politics. The Hapsburg royal family never understood how to properly administer and to preserve the vast inheritance fallen to it. Philip IV (1621-1665) indeed maintained a magnificent court, fostered and supported the arts and sciences; b

but also he did not stop the decadence of the state, that commenced under his predecessors. Under his government bloody revolts broke out in Spain as a result of open violations of the individual rights of the provinces, of the mismanagement of the state finances, and of weak opposition to the measureless encroachments of the court favorites, which in combination with the costly and unlucky wars against France and England destroyed the prosperity of the country and crippled its external strength. The national possessions were constantly reduced. The decadence became general in the second half of the 17th century. Only after the beginning of the 18th century with the accession of the royal house of Bourbon (1701) to the government, did better times come to the country. Art did not keep equal pace with the political development. The political advance occurred too rapidly and was due too much to external events, for the intellectual life to follow it. This attained its climax only at a time when the political highest point of the nation had already passed in the 17th century, thus in the age when Spanish poetry produced a Lope de Vega and Calderon de la Barca, and which in painting saw masters like Zurbaran, Velasquez and Murillo. The deep misfortunes in the inventions expressed in their works and the high national self-consciousness in combination with the love of ostentation peculiar to the Spaniards also was expressed in the architecture. More than before and in consequence of the continued financial decadence of the nation was art restricted to the court and the church. The problems thereby proposed required an important increase in the artistic means of expression in the sense of Baroque architectural principles, that proceeding from Italy also found entrance into Spain.

It could not fail, that the Barocco, which had already properly reached its full maturity in Italy and had attained to universal development, should then celebrate its wildest and most extravagant orgies just in Spanish lands, that had at command an extraordinary abundance of decorative expedients, whose artists already inclined by nature in their exuberant imagination toward a limitless tumult of forms, and with a people, whose enjoyment of luxuriant ornamental work was so

long suppressed under the reign of the severe style.

II. Historical Development and Style.

The transformation of Spanish architecture to the Barocco style occurred in the second decade of the 17th century. About 1620 its conquest was decided. The new conception was expressed from the beginning substantially in the decoration. As in the Plateresco (volume 2, page 237), this brought the special endowments of the Spanish into the clearest expression. The architectural system continued in the architectural style developed by Juan de Herrera (volume 2, page 243), which was no farther developed, aside from the grouped arrangement and the keeping of the architectural members. The monumental appearance of the more important structures permits the influence of Herrera's architectural tendency to be clearly recognized.

Until the end of the 17th century the works of the Spanish Barocco style, at least in the subdivision of the masses, bear an entirely quiet character. Frequently may be seen a leaning toward Roman-Florentine art. Only the treatment of doorways and windows and the ornamental finishing of preferred parts of the building on the exterior as well as the interior results in ostentatious Barocco forms, and sometimes in a richness carried to the most extreme limit. (Fig. 34). From 1690 onward set in the best period of the Spanish Barocco style. Its development is connected with the works of a native architect, Jose de Churriguera (1650-1723) from Salamanca, a learned and extremely fertile artist, whom his countrymen celebrate as the Michelangelo of Spain. From him the Spanish Barocco received its peculiar coloring; he created the Churrigueresque style named after him. This indeed adhered to the basal architectural course relating to the arrangement of the supports (mostly hermes) and cornices for dominating the masses, but passed into the most capricious mixtures of styles, repetitions, curvatures and perforations, clothing the whole in such wild and abruptly applied decorations, that the structural idea almost completely disappeared. (Fig. 35). Thus originated at least in the later and extremely labored climax of this style wonderful show pieces, that interest observers

accustomed to the art conceptions of Italy or of northern countries, as if they sprang from the feverish form impulses of an indeed very richly endowed but diseased and overexcited brain, which employs its dim recollections of style in a most debauched Barocco, and in an Indian heaping up of the members for a fanciful structure, and has plastered and hung this over and over with richly framed pictures and cartouches in relief, with garlands, wreaths, strings of fruits, shells, draperies and the like. We have in this style, which received unlimited approval by the Spaniards, indeed the most extreme climax of the Barocco style, in contrast to which the extravagancies of Brocchini appear like severe academic compositions. The Churrigueresque style is a phase closely allied to the Plateresco (volume 2, page 237). It shows its particular strength in the decoration, and was chiefly employed on preferred portions of the structure on the exterior and the interior, especially on portals, altars, in secretaries and the like. But it there goes to the extreme limit possible (Fig. 44) in the breaking of lines, cornices and surfaces. In the treatment of the interior even, it has taken part in but a slight measure in the great problems, as they were solved in Italy; in this respect it remained far behind Italian art.

Churriguerism indeed captivated the masses of the Spanish people to a great extent. It maintained itself in undisguised character until the end of the period. But it never attained absolute supremacy. It was unavoidable, that Jesuitism should exercise a deep influence in the strongly Catholic country, that appeared in the entire civilized and intellectual life and particularly in the architecture. On its works was shown earliest and most distinctly (already from the end of the 17th century) the turning from Churriguerism toward a severer conception in the sense of the masters of the last period of the Italian Barocco returning to classicism. Jesuitism surpassed in its first creations the model of the church Gesu in Rome (volume 2, page 227) on Spanish soil, but there introduced a change, in so far as it made the arrangement of galleries over the side chapels the rule, also continued them to the entrance end and devoted them to the clergy, so

that they were separated from the people. Here thus appeared the system of the court church (in a manner similar to the palace chapel at Versailles and the court church at Dresden). The choir thereby lost its importance. For the congregation was designed the hall-like room for preaching with the side connected chapels. Since Jesuitism chiefly carried on its contest for the spread of the church by the spoken words, pointed by the weapons of science and of classical culture, the chief stress was laid on the impressive treatment of the room for preaching. In the developed court and preaching church was inserted between the inner principal room and the series of chapels extending around it another special aisle for the use of processions. Over this aisle were arranged galleries.*

* *The developed type of this kind is shown by the former Jesuit church of Nuestra Senora de Belen at Barcelona, between 1681 and 1729.*

This type was only employed by the Jesuits for the churches for congregations erected by them. For the churches of their own Order, they chose the central structure (Fig. 36), which more clearly expressed the unity and exclusiveness of the Order and the equality of the members, than did the plan with nave and galleries. The architecture exhibits the ground lines of the Italian Barocco, yet with numerous accessories in the Spanish style, chiefly expressed in the decoration and in its distribution, and in the magnificence of the colors. (Fig. 37).

Another spirit took the lead in the art life of Spain, when after the death of Charles II, the last of the Hapsburgs on the throne of Spain, Philip V, the nephew of Louis XIV, inherited the Spanish crown (1701). The new monarch from the house of Bourbon, a branch of the French royal house of the Capets and his (second) wife, a born Farnese of Parma, with a feeling of the supremacy of the contemporary art of their native lands, sought to bring the art of Spain to the height of those of France and of Italy, and to develop a court life as magnificent as that of the sun king at Versailles. They called foreign artists, especially Italians, to Spain, and in accordance with the tendency of the time toward a learned con-

conception of art, founded academies of art after the model given in Paris in order to obtain new strength for the culture of art. Thereby also in Spain was adopted the Italian=Classistic tendency of the Barocco style (Fig. 38). Until then the native masters had chiefly fallen into the development of overrich and decorative ostentation; now the attention was also devoted to the solutions of the ground plan and the creation of the interior for themselves. The severely scientific conception of art and of its problems proceeding from the academies and zealously fostered by the nearly absolute court, worked in increasing measure to clarify the Barocco, dominated by the Churrigueresque abundance of forms. The time came when also in Spain the books of Vitruvius were translated into the national language, and his instructions were esteemed as the highest manifestation of the art spirit. The Barocco style was indeed too deeply rooted in the people, for it to be quickly suppressed by learned studies. The entire first half of the century is filled with the contest of Barocco ideas with the classistic endeavors, and even in the second half in the buildings of the most important native masters of this time, of Ventura Rodriguez (1717-1785), celebrated far beyond the frontiers of Spain, the Barocco architectural idea had influenced the creations of interiors with all purity in the expression of form. In Rodriguez' works was completed the change from the late Barocco, already moving in quiet paths, to the expressed classicism.

A phenomenon of special interest to the history of architecture in the Spanish art of the Barocco period is the Plate style. This was directly derived from the art of Herrera the Elder (volume 2, page 243) as an independent severe tendency with the aim of developing stone construction as such, which asserted itself beside Churriguerism during the entire Barocco period, even if under limitations to a relatively small domain, and indeed to the northwest, that portion of the country in which the Spanish blood had received the strongest addition from the immigrant Celts. This style has its name from the express use of plates as an architectural and ornamental motive. The plates are partly circular or are cut out in

ovals as rings, later with lower edge cut as drapery, and finally with dry outlines in the lines of the northern overlaid ornamentation. It forms both panels, as connecting members between the windows and architectural members, and also particularly plate hangings like consoles, frequently recalling much in Moorish art (volume 1, page 209), which on cornices and wall strips clearly show themselves as supporting motives. (Figs. 39, 40). The Plate style in accordance with its entire nature is removed in a far less degree from these requirements, that about the middle of the 18th century caused a restoration of Spanish Barocco architecture in the sense of classicism. Consequently with ease and without entire abandonment of its former ground principle was completed the return, furthered by Rodriguez, to Herrera's grandeur, clarity and simplicity, thus to that art style from which proceeded the Plate style.

III. The Most Important Monuments.

In Spain the Barocco style was already prepared for in the creations of a master still belonging in time to the high Renaissance of Francisco de Mora (died 1610). He was a pupil of Juan de Herrera (volume 2, page 243), his colleague and the finisher of his works and after his death, court architect of Philip II and III. He began entirely in the style of his master, but soon developed greater freedom and a richer treatment of forms. His nephew and successor, Juan Gomez de Mora (died 1648), after 1611 the highest architectural official of Spain, was actually the path-breaker of the Barocco. The grandeur of his designs and the novelty of his ideas of form found the liveliest approval. In the plans of the buildings and even the structural system he adhered to the path traveled by his predecessors. He indeed treated the structural members in the classical sense. On the contrary he executed on the enclosures of doorways and windows a previously unknown and lightly animated play of lines and forms, with which he introduced an entirely free and genuine Barocco treatment of the architectural members (page 106). On the Jesuit College of La Clerica in Salamanca begun by him in 1617 (completed 1750) with a magnificent court, whose facades are sub-

subdivided by a colossal order of three-quarter Composite columns, the Barocco richness fully appears. Beside him worked the gifted Alonso Cano (died 1667). The importance of this master lies in this, that he replaced the wall columns by rectangular wall piers or by wall strips, and as the walls were animated by circular or elliptical medallions, for these were substituted thin plate hangings cut out below and overlaid over each other, whereby he became one of the founders of the Plate style. In the arrangements calculated for picturesque effects, the utilization of perspective effects and the freedom and the intentional novelty of the form, he characterizes himself as a master of Barocco. His principal work is the facade of the cathedral at Grenada (after 1652). On this he employed strong buttress-like wall piers to divide the facade into three parts, and connected them above the second story by round arches, which with the low superposed balustrades serve as the termination of the facade. The facade thereby acquired a subdivision into three deep round-arched niches and thereby a very strong effect of shadows; but on the whole it rather makes a picturesque, theatrical impression like a triumphal arch, rather than that of a church. The repetition of the motive of the round arch above the portals, in the windows and the medallions has a tiresome effect.

More important, particularly as also a creator of interiors, was Francisco Herrera the Younger (1622-1685), the builder of the first great Spanish cathedral in the Barocco style, Nuestra Señora del Pilar in Saragossa (Zaragoza), which was begun in 1677. The ground plan has the Spanish church scheme of the high Renaissance in its highest development as an enclosed rectangle, 442.8 x 218.8 ft., of three aisles with chapels around it between the buttresses. The structure supports on massive piers covered by Corinthian pilasters a great main dome, two side domes over the middle aisle, and four low domes over each side aisle. (On the transverse axes lying between the middle domes). The angles are accented by four towers, but one of which was completed at a later time. The effect on the exterior lacks all organic development. (Fig. 41). The interior received after 1753 by Rodriguez a facing in Roman-

Classistic forms. (Page 56; Fig. 49).

With the appearance of Jose Churriguera (page 43) commenced the best period of Spanish Barocco art. His first work is the tower of the late Gothic cathedral at Salamanca, in the sacristy of which he combined in a very confusing way the Gothic. The starting point of his high artistic fame is formed by the catafalque of queen Marie Louise of Bourbon designed by him. (In March, 1689). This catafalque had for Spanish Barocco art the same importance as Bernini's high altar in S. Peter's church at Rome for the Italian (page 6). According to the design remaining it was constructed in the architecture of the triumphal arch with an arch between piers with flanking double columns and with a niche above it, the very high framework being loaded and hung over and over again with decorative work. (Figure decoration, draperies, flags, wreaths of leaves and of fruits, Barocco cartouches and ornaments, emblems of death etc.). For numerous portals and altars this design became a direct model. Churriguera's principal work is the city hall at Salamanca, a structure entirely designed and also apparently erected by him, whose centre of gravity lies exclusively in the facade, while the ground plan was evidently treated quite superficially. The massive three story facade has five axes. Only the two outer ones are flanked by composite half columns (indeed with reference to the originally projected but never executed tower-like angle structures). On the middle portion containing the three inner axes, the piers in the lower and second stories are subdivided by narrow vertical projections, in the upper one by hermes. The ground story opens by five arches, that on the middle axis being about one half wider than the others, therefore terminating in a depressed arch. A balustrade with statues and gable turret over the middle space as a bell turret crowns the too richly treated facade.

Among Churriguera's pupils is Narciso Tome, likewise a purely decorative creator, has been made known especially by his portal of the university in Valladolid (completed 1715; Fig. 42), and Pedro Ribera, who surpassed his master in regard to capricious overloading of forms by his extraordinarily ostentatious facade for the Hospital Provincial, now Hospital of

Madrid (after 1622), which is most strikingly characterized by the Churrigueresque style. (Fig. 35). On the palace (casa) of Marques de Dos Aguas in Valencia (Fig. 43), erected 1740-1745 after the design of the painter Rovira, he shows a more picturesque conception, inclined toward the south German Rococo. The latest, in the animation of surfaces and members and the breaking of lines going to the extreme stage of the style, is visible in the sacristy of Cartuja in Granada, a small hall church decorated by the lay brother Francisco Manuel Vazquez in 1727-1760. (Fig. 44). Here even the shafts of the piers are covered by curved mouldings, that roll up in volutes and are beset by other heavy ornamental members heaped on each other. The ornamentation betrays Indian-Mexican influences fostered in the South by the commercial relations with the colonies, and it surpasses in Barocco overloading all that the other western art can offer anywhere.

The Jesuits completed their most important architectural undertaking in the Jesuit College established on the birthplace of the founder of the Order in Loyola (begun 1689, roughly completed 1738), for which an Italian master, Carlo Fontana, furnished the design. The plan has the form of an entirely symmetrical and very wide rectangle with three internal courts, of which the middle one is arranged on the main axis behind the church. The church is treated as a circular domed interior, around which extends a concentric outer aisle (Fig. 36). The drum and the dome are supported by eight massive piers. Before the entrance lies the portico opening by three round arches and projecting from the facade. (Fig. 31). Opposite it stands the high altar in a niche in the external wall. The entire interior is covered by colored marbles and jasper.

Under the Bourbons, Filippo Juvara (page 36), whom Philip V had called to Spain, attained a position dominating the court architecture of Spain. By him is the design for a new and magnificent Royal palace at Madrid. The ground plan exhibits a rectangle formed by four wings, which enclose a square pier court. Juvara died in 1735, even before the occupation of the building. His pupil and successor was Giovanni Battista

Sacchetti, likewise an Italian born in Turin (died 1769), adhered to the plans of Juvara, even if he reduced the dimensions somewhat (to 374.0×393.7 ft.). In the year 1737 the building was commenced. On the principal axis lies in the ground story a wide but shallow entrance hall, behind being the proper vestibule, on the right of this the main stairway in three branches, whose plan and treatment recall much in palace Caserta (page 39; Fig. 14). In the upper story one passes from the main stairway first into the anteroom of the halberdiers located over the vestibule, and then into the great columnar hall. Besides the anteroom of the halberdiers in the front wing (over the entrance hall) lies the throne hall. Adjoining these principal rooms are arranged the living and guest apartments. From the vestibule one directly enters the court porticos. In the rear wing the palace chapel is placed on the main axis. The facades follow the system previously developed in Italy:-- rusticated ground story (the ashlar with continuous horizontal joints and without visible end joints), above this being a colossal Doric pilaster order with massive main cornice and a crowning balustrade. Only on the moderately projecting angle portions and the very slightly projecting middle part are employed Roman fluted half columns. (Fig. 45). In the internal decoration French art won here a determining influence. Chinese motives were soon mixed with the somewhat clarified Barocco forms, and thus was also developed in Spain a sort of Rococo, even if not in the same graceful perfection as in France. The forms are dryer, appear more as if collected together and not as if done at one time, as in the French Rococo. (Fig. 46). But otherwise the interior of the Royal palace is richly and splendidly equipped. From 1749 onward Ventura Rodriguez had the superintendence of the construction. It was occupied in the year 1764. Sacchetti also erected in 1739 the garden facade of the Royal palace of Ildefonso (Fig. 38), designed by Juvara entirely in the spirit of the late Roman-Classical Barocco. The general design was by Teodoro Ardemans, who was born in 1664 at Madrid as the son of a German belonging to the king's life guards, and he later enjoyed much high esteem also as a painter, as

well as an architect and the highest architectural official of the country. The building was begun in 1721. It has its greatest extent in depth and not in breadth. The nucleus of the building encloses a pier court on all sides. Before the main facade lie parallel to the principal axis two wings with angle pavilions, a court of honor with open front left between them. The palace church is added on the transverse axis passing through the middle of the pier court. The great double stairway in three flights lies on the main axis at the rear facade. In the architectural treatment are combined influences of the Mansard school with Churriqueresque forms of details. The profiles exhibit the peculiarities of the art style of Borromini. The middle building of the garden facade (Fig. 38) was designed by Juvara but erected three years after his death by Sacchetti, and is entirely in the character of Roman-Classistic Barocco of the Italian school of Fontana and Juvara. The colossal park is grand. Its plan permits the recognition of the grand lines of French garden architecture of that time, yet with a stronger predominance of nature. The palace of Ildefonso, the favorite residence of Philip V, can be compared with Versailles only in regard to the garden design. The extensive palace in Aranjuez, newly built on the site of the old structure burned in 1665, erected in 1728-1752, for which the court architect P. O. Idogro and after his death, Teodoro Ardemans furnished the plans, by the royal command received entirely the architecture of the severe French art of Blondel's tendency.

The church architecture of this time produced its highest work in the new cathedral at Cadiz, begun 1720 but first dedicated in 1838. It is a basilican design planned by Vicente Acero (died 1722), consisting of a three aisled nave 180.5 ft long, but only composed of three narrow bays and extended by side chapels, a transverse aisle with the width of the middle aisle projecting in apses from the side walls, and an adjoining central choir building. This is arranged on five sides of a regular octagon, with a wider opening of the central room to the middle aisle, and with choir aisle and a circle of chapels as a continuation of the side aisles and chapels of

the nave system. The total length amounts to 374.0 ft. The facade is formed of a middle building with a great semicircular terminal niche and triangular pediment with two low angle towers, round below and polygonal above. Above the crossing rises a principal dome, and in the choir over the high altar treated as a circular temple is a subordinate dome. The preference for curves in the ground plan, the diagonal position of the projections from the piers treated as three-quarter columns, the heaping of the members and the ornamental accessories allow the recognition of the Churrigueresque basal ideas, even if also otherwise the detail forms are designed rather severely in the classical sense. Acero also designed the facade of the cathedral at Malaga (begun 1724; volume 2, page 242), distinguished by its rich columnar architecture. On this in each story as well as at the corners of the square flanking towers 275.6 ft. high, as well as on the piers of the recessed church facade in two stories and subdivided in three parts, are pairs of fluted columns on high pedestals furnished with broken entablatures. The show piece of the external church architecture of the Spanish Barocco style is the facade built by Jaime Bort, an acclimated Hollander, for the cathedral of Murcia, dating from the middle ages, on which the clarity of Netherlandish art is combined with the freedom of the art of Borromini, and the ostentation of the Churrigueresque style into a splendid and certainly purely ornamental show piece. (Fig. 48). In the first works of the much employed Ventura Rodriguez (page 47), who like scarcely any other Spanish architect enjoyed the confidence of the court and also of the people, dating from about the middle of the 18th century, the Barocco architectural spirit still influenced the treatment of the interior, the picturesque tendency and the moderate subdivision, while the form expression held itself afar from the Churrigueresque freedom. At the church of S. Marcos in Madrid built by him in 1749-1753, the plan is composed of four ellipses, whose sequence produces a strong enhancement of the impression of the interior toward the third and largest ellipse forming a domed room. In the interior subdivided by a colossal composite order of pilasters predominate Classicistic forms. After the completion of this church

the master devoted himself to the Vitruvian-Roman tendency. This guided him in the construction of the cathedral of Nuestra Señora del Pilar at Saragossa (page 49) undertaken in the year 1753, whose internal architecture (excepting that of the chapel of grace built in the middle aisle, where with all severity in the profiles he could not entirely avoid Barocco or ostentation), he restored in expressed Roman-Classistic forms (Fig. 49). He likewise built the single completed tower at the southwest angle of the church; while retaining the old plans. For his later church buildings Rodríguez preferred the central plan. To a great number of mediaeval churches he gave new façades. Among these is that of the cathedral of Pamplona (completed 1783) characteristic for the style of his later time by the picturesque treatment, and by the members kept in severe and heavy forms. The master here completed the old design by a church wall crowned by a triangular pediment and statues. He placed before its angles square towers not projecting beyond the side walls, between these being a corridor-like portico with projecting portico of four columns and a parapet balustrade over its recesses. The mouldings recall those given by Herrera the Elder to his church facade of the Escorial. (Volume 2, Fig. 285)).

The Plate style appears in its form world, entirely supplanting all other ornamental work as pure and refined in the interior of the church of S. Francisco in Santiago de Compostella built by Simón Rodríguez. Here the capitals are transformed into Plate drapery like consoles. (Fig. 40). The chief work of the Plate style is by Casas y Novoa (died 1751), the facade of the cathedral in Santiago de Compostella built after 1738. (Fig. 50). It consists of a lofty middle building crowned by a pediment and two lower wings, behind which on Romanesque substructures two massive towers rise to a height of 229.7 ft. In the general appearance is combined the expressed vertical tendency of the Gothic with the ground principles of Barocco architecture and its luxuriant wealth of forms in the happiest manner. The striking development in height, the great enjoyment in the treatment of the pediments by curves, volute and obelisk terminations, with many motives

from the northern overlaid ornament, that is here transformed into Plate work, permit recognition of a strong influence of the Netherlandish late Renaissance and of the Belgian Barocco. The Plate style maintained itself in the domain ruled by it, owing to its architectural tendency allied to the Classicistic conception of art, in some smaller works for nearly three decades beyond the time, at which in the other parts of the country the Barocco style had already been overcome.

PORTUGAL. Under the strong pressure for extension by Philip II of Spain, Portugal lost its independence from the Hapsburgs in 1580, but this was again recovered in 1668 in consequence of the weakening of the Spanish state. But Portugal never more succeeded in an independent development in art. The great hospital in Braga (about 1650) with the church facade flanked by two towers still remained within relatively quiet and clear forms, which frequently recall the south German early Barocco. The palace there on the contrary bears a very luxuriant ornamentation, and likewise the house of the Mexican (Fig. 51), whose heavy expression of form was strongly influenced by the Belgian Barocco. The principal work of the Portuguese Barocco style is the Royal palace with the monastery at Mafra, a colossal structure with the same purpose as the Escorial in Spain (volume 2, page 243), yet planned in still greater dimensions than that, as a rectangle 725.1×823.5 ft. with nine courts. The angles are accented by strongly projecting pavilions with ogee curved domical roofs; the middle of the principal facade (Fig. 52) is occupied by the richly subdivided church facade with two towers, behind which rises the church dome elevated on a high drum. In spite of its magnitude and the immense expenditure, under which the small country became poor, this building can raise no question of artistic importance. As architect is named a German, Johann Friedrich Ludovici from Regensburg. Juvara from Turin erected in Lisbon in the years 1731-1734 the Royal palace of Ayuda and the Patriarchal church in the style of the Classicistic Italian Barocco. About the middle of the 18th century, there also came into use in Portugal as into the adjacent country the severe Classicism with its intentional contrast to

the Barocco, its tasteless and rigid correctness.

3. Architecture in the Period of the Barocco and Rococo Styles in France.

I. Historical Development and Style.

The political advance made by the French state after Francis I, and that was retained in the entire 16th and 17th centuries, had as a result a gradual transfer to France of the political centre of gravity. Also in this country had the reformation developed violent strife and bloody wars through the activity of the Huguenots, from which Catholicism came out victorious, indeed without succeeding in completely overpowering Protestantism. By the edict of Nantes (1598) on the one hand the Catholic faith was declared to be the religion of the state, and on the other Protestantism was publicly recognized as a religious association. As in Italy and Belgium the church also in France zealously cared for its internal defense and strength. The abundant ecclesiastical activity developed by the counterreformation urgently fostered its relations to the intellectual and social life of the nation. It was chiefly the transmitter of the intellectual and artistic impulses proceeding from Italy. But the Huguenots likewise were not inferior in activity to the state church in the provinces dominated by them. They had found their adherents in the citizen class in the cities and showed themselves as actual representatives of a more intelligent and expressed conception of the national life and art. In the Netherlands the opposition led to an entire separation. In France the greatly strengthened kingdom formed the power, that dominated and comprised all tendencies; it drew Catholics as well as Huguenots into its service. The opinions expressed by these partly resulted in independent creations beside each other, partly alternately influenced each other, and partly combined in a common freely chosen work.

By the internal conditions of the French state was required, not only the highest development of all persons at command, but also their harmonious working together as much as possible. Richelieu's administration (page 61) had as a result a general

centralization of the power of the state and of all public life, from which the capital Paris derived the greatest benefit. It became the centre and starting point of all the intellectual and artistic interests of France, a city filled with a splendid life and with great aims. The tense national feeling pressed toward independent activity, for freedom from Italian tutelage in questions of culture and of intellect, for independent appreciation of the antique also native on French soil, and of the laws of art transmitted by it. At the same time the kingdom developed into an unlimited royal power. The inclinations of the absolute monarch were devoted to an externally most impressive personification of the monarchical principle. By the nationally proud and vainglorious French people the ostentatious development of court life found support and public approval. Thus in the internal and external conditions, France found all bases and impelling forces for an indeed divided, yet by its entire nature free, national and magnificent evolution of art.

In a still higher degree than in the period of the Renaissance did art then receive an expressed courtly character. Its entire development was connected with reigns of the different monarchs and with the activity of the artists preferred by them. At the time when Richelieu commenced his epoch-making labors as a statesman (1624) until the majority of Louis XIV (1661), was completed the transition from the late Renaissance to the Barocco. When the king grasped the reins of government, to become his own minister and even to guide the fate of the country, the French Barocco style set in full force. Under his long reign this developed into a specific national art style. During the Regency (1715-1723) the Barocco style then matured into a very interesting transition stage to the last appearance of the style developed from the late Renaissance, the Rococo. *

** The name "Rococo" is derived from "rocaille", rashell or grotto work, which plays a great part in the new world of form. It is generally common in Germany. The French name the different phases of the style, as in the Renaissance, after the names of their kings. (Volume 2, page 247).*

Thus we have to distinguish four style phases in the period of the Barocco and the Rococo in France.

1. The early Barocco (style of Louis XIII"), which still prevailed in the minority of Louis XIV, thus falling in the time from 1625-1643.

2. The developed Barocco ("style of Louis XIV") from 1643-1715.

3. The early Rococo ("style of the Regency") from 1715-1723, whose style coloring however continued to about 1735.

4. The developed Rococo ("style of Louis XV") from 1723 (or 1735) to 1750.

We shall see in the following, that the appellations of "Barocco" and "Rococo", in application to the art styles in the respective epochs are not generally correct, that rather the artists working beside each other went different ways, corresponding to the before mentioned diversity of their views and the inequalities of the court influence, and in part pursued entirely opposed aims. In general may be distinguished three principal tendencies. One is that of the proper Barocco masters. These willingly adopt the influences proceeding from Italy and work them over in the national sense. The others are rather theorists, classicists, adherents of a severe academic conception of art and of its problems. The third occupies a position between the two, is inclined sometimes more to one or the other side, or it decides, as finally became the general rule, for a severe classicistic style in the external architecture, and in the internal for a free conception of art in the sense of the flourishing Barocco or Rococo. Hence in considering the species of styles, we shall also sometimes mention the leading masters, who are to be regarded as their principal representatives.

The early Barocco style was introduced by Jacques Lemercier (Lemercier, 1585-1654), a pupil of Salomon DeBrosse (volume 2, page 234), the architects favored by Richelieu. Lemercier was in Italy for several years, there became acquainted with the art style of the Barocco, which he willingly adopted, but gradually clarified it in the sense of the French spirit. The conditions were indeed in France different from those in

Italy. The court life produced peculiar and new requirements, which were first to be considered in palace architecture. Instead of the Italian palace, grand in itself, vainglorious, but quite inconvenient in the arrangement and treatment of the proper living apartments, were required first of all habitableness and comfort. In Italy public, social and family life was chiefly spent on the great squares, in the streets, the loggias and the courts; but in Paris already on account of the climate, it was developed in the salons and the more private rooms of the family residence. Assemblages were indeed not rejected. The absolute monarchy and great nobles emulating it rather demanded the development of external magnificence as well, and perhaps more than in Italy. But less was required for the street view than for the rooms, in which the courtly and social life passed. The French chateau must therefore afford a very impressive and convenient habitation according to the number, the dimensions, and the sequence of the social and living rooms, and in regard to the tasteful arrangement of the small rooms and the corridors for the housekeeping and the servants. For the manner in which these were to be attained, the wife, who at that time played a great part not only in society and politics but also in the art requirements, had a determining influence according to tradition. It is stated that queen Maria sent her own architect to the talented Marquise de Rambouillet, well known for her good influence on famous countrymen, whose mansion (Hotel d'O) passed for the ideal of habitable and comfortable arrangement. In this occurred the arrangement, where the grand stairway was transferred from the middle axis to the side of the entrance hall in order to obtain an unbroken series of rooms on the garden facade. The dimensions of the rooms varied with their purposes. For the more intimate affairs were provided smaller rooms. The marquise had placed the doors beside the windows on a continuous axis. When about the middle of the 17th century the famous lady was frequently confined to her bed in consequence of illness, she caused the bed in her sleeping room to be enclosed by a balustrade as a screen, and thenceforth received there the visits of her more intimate

friends. the example given by her found imitation. The sleeping chamber with the state bed became the favorite apartment of the French chateau. (Fig. 83). Also in other matters the treatment of the ground plan of the Hotel d'O as a model influenced the royal buildings.

The higher and lower nobility adopted the court forms. It no longer personified the independent chivalry, trained in military service, but an intellectual and intellectualistic society of the salons, that busied itself with politics, science and art, and pleased itself by the care of the person, court etiquette and high life. To externalities and the court ceremonial was devoted the greatest attention. It was regarded and treated almost as a separate and important science. As in everything else, so also in the plans of the residences of the nobles and even in the mansion of the well to do private citizen was determinative the model given by the court.

By Louis Leveau (Le Vau, 1612-1670) and Pierre Lemuet (1591-1669) followed a typical development of the ground plan of the city mansion (hotel); the latter laid down the requirements relating to it in a standard work published in 1647. According to this the buildings for the residence, if possible, should not be erected directly on the street, but should be separated from it by a forecourt. In the building itself only the housekeeping and subordinate rooms should lie on the street side, but the apartments intended for the residence should be arranged on the garden facade. In the middle should be placed the great festal hall, at both sides of which should adjoin the "antechambers". The line of this room or suite should terminate in the sleeping chamber. The external architecture -- and this characterizes the French conception -- should retain a simple, bold and distinguished appearance on the street facade and on the court next the street, but should be rich and splendid on the garden facade. Thus the architectural effect was first of all determined for the occupant of the residence and his guests, since only these had admission to the garden.

The architectural treatment by Lemer cier shows in the conception and the treatment of details a strong influence of It-

Italian forms. Yet the specific French taste in art is attested by a firm adherence to pavilion architecture, to the high roof over each separate portion of the building, and to the refinement of the members and of all details. On the whole is apparent less monumentality, but greater elegance and charm. Leveau had employed in his first period the Italian Barocco motives in a free choice and beside the northern. But in his later time was completed a transition to the national art style. He frequently omitted the orders; angle quoins and wall strips appeared in their places. The wall surfaces often received a subdivision by enclosures. With the rejection of the great architectural expedients came the tendency to refinement of details. Lemuet in his first works was still entirely dependent upon the masters of the French high and late Renaissance, but he showed himself later accessible to Italian influences, when he employed the architectural members and Roman ornamental work in a tolerably severe conception.

All these masters were excellent in spirit and in internal as external and formative creative power by the important Francois Mansart (1598-1666). He not only studied zealously the works of the Italian theorists, but likewise the antique, in order to penetrate as deeply as possible into the mysteries of its effect. He desired to furnish architecture by itself with full effect, independently of decorative work in relief. He sought its beauty by its own expedients. He first brought into well conceived relations the required rooms in their areas, arrangement and construction, and then devoted the greatest attention to the treatment of their details. But he also desired to obtain a national style, and therefore paid great attention to the masters of the French Renaissance. By the steep roofs rising above the principal cornice, the vertical dormer windows breaking through them, * and the tall and monumentally treated chimneys, he produced a very animated outline and thereby a powerful total effect of the superstructure, by which was required a certain restraint in the effect of the masses in the subdivision of the facade. For the architectural treatment he employed for the exterior and the interior the architectural orders of columns or pilasters

in the most charming grouping and in an extremely noble, conceived as severely classical, very finely designed profiles. (Figs. 54, 55, 78). Francois Mansart was an independent and powerful artistic individuality. The series of forms prevalent in Italy in his time were most thoroughly refined by him in the sense of the French spirit, striving for charm and elegance; he was a thoroughly national master, whose ground principles and aims were nearly allied to those of Deprosse. He indeed never entered the service of the king.

** These dormer windows were later commonly termed "mansards" after Francois Mansart, and the form of the broken roof preferred by him also received the name of "mansard Roof".*

The developed Barocco style of Louis XIV takes its start from the activity of a master, whose ground principles in many respects were entirely opposed to those of Mansart, of Charles Lebrun (1619-1690). Beginning as a painter from the school of the severe N. Poussin (died 1665), who had penetrated into the spirit of the antique more deeply than any of his contemporaries, and from whom a certain scientific conception of art had been transmitted to him, he betook himself to Italy (1642), where the art of Pietro da Cortona (page 33) exerted a determining influence upon him. In the year 1646 he commenced his rich activity in Paris. Here he showed himself a highly gifted representative of the advanced Italian Barocco style, which was diverted by him into the course of the French art taste. In his works Lebrun took architecture, sculpture and painting into his service in equal proportions, but had at command all richness in materials and technics, personifying with perfect certainty the entire meaning of the ostentatious court existence. The entire series of forms of Italian art was accepted by him, but was transformed in the French sense in regard to a more classical severity, particularly in a very moderate use of curves, and a finer and properly subdued forms of details, enriched by a daring naturalism, in which he excelled all Roman architects of that time. Lebrun employed the architectural orders of pilasters (Fig. 56), when he intended a grand effect, but he preferred otherwise broad and showily treated enclosing borders for subdivi-

subdividing the walls and ceiling and for enclosing windows, doorways, reliefs, paintings and gobelins. * In an extremely fanciful way the different moulded members were adorned by freely treated egg-and-dart and foliage mouldings, pearl beads and the like. Luxuriant enamel work, in which acanthus scrolls with fleshy modeling, but with very finely treated leaf outlines and naturalistic rosettes of leaves played the chief part, animated the panels, the broken angles and the caps. (Figs. 57, 80). The material on the walls is marble for the structural members, stucco for the enclosing borders, both on the walls and the ceilings, in combination with rich gilding.

** Gobelins are tapestries woven by hand and representing entire paintings.*

It was not surprising, that the show-loving king Louis, with the most impressively conceived personification of his power and his personality, and after he had learned his capacity and his art skill, should have given his entire confidence to Lebrun, and on the erection of his residence palace at Versailles, should have given to him the magnificent problem. Lebrun was the most influential architect of his time in France, the creator of the French Barocco style striving for magnificence, that afforded to the passionate monarch the desired background for his luxurious and animated festivals.

Lebrun had gradually supplanted all other architects in the favor of the king. But the art style developed by him could not secure supremacy in the domain of the art life of Paris, nor permanently in that of the royal court. The adherents of the severe classical conception represented by Francois Mansart sought to work in his sense, and they had important men of the intellectual aristocracy on their side. The erection of the Louvre was to be a test of strength in the contest of the two tendencies in art. In the year 1664 the French government arranged a competition for obtaining the plans for the still lacking east wing, for which Leveau and his pupil d'Orbay had furnished a design kept in the ancient style, as they believed. The most esteemed architects participated in it, among them being Francois Mansart, Lemercier, Jean Marot

and Pierre Cottart. The plan furnished by Francois Mansart obtained the approval of the government; but its execution failed, since the master would not subject himself to the obligations proposed to him. Because men could not agree in the acceptance of another design, Bernini (page 30), who passed for the most skilful of all living architects, was required to give his opinion on the designs presented. Bernini himself came to Paris. He was received there with princely honors, such as were neither shown before nor later to an artist. He rejected the works offered and prepared a project himself, that was restricted entirely to the enclosed monumental character of the Italian palace architecture of the Barocco period. (Fig. 53). But since he had paid no attention to the national French taste in art, as it had been trained especially by Mansart's works, he thereby found no approval. Without having reached any positive result, he must again return to Italy. Now the influential French poet, Charles Perrault, a zealous defender of severe classical requirements, went to the principal minister and the king with a new plan prepared by his brother Claude Perrault (1613-1688). The decision -- indeed in view of the preference of the king for the majestic and harmonious effect of the columnar architecture -- in his favor. Bernini's design and another plan made by Leveau were rejected, Perrault's was adopted and executed. (1637-1674; Fig. 31). Claude Perrault was originally a physician, who busied himself greatly with architecture. He translated Vitruvius into French (1673) and in a very clear presentation, and he appeared in speech and writing for an artistic and philosophical mode of considering architecture and its problems in close relation to the antique. Thus beside the flourishing Barocco of Lebrun also came into favor at the court the severe classicism.

The Louvre competition had produced a strong contest on art questions in public opinion, under the impression of which and chiefly by the urgency of the brothers Perrault, the founding of an institution followed, that in future should become the starting point and support of classicism, that of the Royal Academy of Architecture. (1671). The task was proposed to

it to impart public instruction on the rules of architecture, as they are given by the most distinguished monuments of antiquity and the works and writings of the great masters, particularly of the highly esteemed Palladio. As an instructor and leader of the institution Francois Blondel (1618-1686) was called. He was previously a mathematician, then an artillery officer. In his office as instructor, his literary works, his designs and executed architectural works, he showed himself as an expressed adherent of a severe classicism. In his great work, "Cours d'Architecture", that appeared in 1675 in Paris, he first returns to the antique in regard to the explanation of the five columnar orders, and not merely to the Roman, but also to the Grecian, which he places higher in the power of design than the Roman. He adopted the orders as conceived by Vitruvius and the later theorists Vignola, Palladio and Scamozzi, and with regard to their scientific basis by Leon Battista Alberti. (Volume 2). He established a theory of proportions extending to all parts of the orders of columns, whose "module" was to serve as a basal condition for a perfectly harmonious effect, since every variation from it produced a discord. With particular emphasis he rejected the heavy ornamental work of the Barocco style, devoted to an error in taste in his opinion. The tendency pursued by Borromini he designated as the very worst sin against good taste and against the laws of beauty.

Blondel even plainly went farther than Perrault in his classicistic demands. The latter desired to recognize in the "orders" not a definite law fixed for all times, but only the harmonious course of the architecture of the ancients, which one in other times and with other views might change according to his own design. * But Blondel had most adherents. He was a distinguished teacher and therefore exercised a very strong influence upon the architects leaving the Academy.

** How freely Perrault opposed the antique is very strikingly shown in his works and measurements for the Louvre. The wing erected by him rises about 13.1 ft. higher than the court facade by Lescot. In order to remedy this mistake, Perrault constructed an entire story instead of Lescot's half sto-*

story. Since the lower retained facade already had the Roman or Corinthian order, and the placing of a Tuscan or Ionic order above it appeared inadmissible, he desired to produce a new French form of column, even surpassing the Corinthian order in lightness and elegance. To obtain ideas and suggestions for this, the king at the request of Perrault in the year 1671 ordered a general competition among artists. The result was entirely negative. With peculiar transformations Perrault himself chose as new ornamental motives for his capitals a crown and feathers-- men did not advance beyond the old forms. -- Blondel, the director of the Academy, saw in the lack of results from Perrault's proceeding the best evidence of the correctness of his own demands.

The king retained at the time in which the contest about the facade of the Louvre went on, and even later still his task for Lebrun and the art style cultivated by him. Certainly it also became generally perceptible in these changes; there was completed, even if slowly and inconspicuously an approximation to the severer classicistic conception. The cause of this is indeed to be sought less in a change in the mind of Lebrun, than in the influence of the court. Even for Louis XIV came a time in which he was satiated by his pompous and luxurious court life and longed for restraint and simplicity. He became conscious of the weakening of his life of the senses and the transitoriness of his grandeur. The misfortunes by which his family was visited, did not remain without influence upon him. His mind and strong nature longed for something higher, for the unchangeable, and he bowed before the divine. The "sun king" was growing old and became a man of the deepest piety. Court festivities became rarer and more moderate. The king remembered his duties to the state. He desired to return to simpler and natural conditions.

These changes also soon appeared in the art of the court. The youthful and extravagant ostentation became clarified in an increasing degree to an orderly restraint and correct formality corresponding to the refined customs of the court in an academic sense in the philosophy of art. The principal representative of this later style of Louis XIV was Jules Har-

Hardouin Mansart (1346-1703), a grand nephew of Francois Mansart. After Lebrun's death, he was the artist most esteemed by the king. As a pupil of the Royal Academy he had received a severely classical training, but in his further work undertaken together with Lebrun on the palace of Versailles, he adhered in regard to decoration to the art tendency of that master. His art in design was nearly allied to that of his great uncle Francois Mansart. Thus were combined intimately in his creations the national classicism with the Barocco of Charles Lebrun. The extravagant luxuriance of form was classified from nonessential accessories, the unquiet curves of the lines were lessened by the predominating straight line. The structural members received a lighter treatment, less calculated for effect of the masses. Otherwise Hardouin Mansart preferably employed the colossal order and in general great expedients. The ornament, whose basis was still the acanthus leaf in full modeling allied to the scroll work of the Roman imperial period, yet treated with more delicate and graceful outlines, remained in combination with naturalistic accessories, but with a freer organically developed drawing in symmetrical arrangement. Hardouin Mansart thus created a truly national style, distinguished in effect as well as elegant and attractive. (Figs. 59, 60, 83).

The restraint practised by the court, particularly after the end of the 17th century, was but unwillingly followed by the French nobility and the higher classes of the population. Externally indeed men held under the ban, in social life as well as in architecture, on account of etiquette the formerly too much restricted passions. So much lack of restraint was enjoyed in the interior decoration. To ornament fell a part incomparably more important than before. It was developed in a remarkable manner. The artist that created the ornament of the developed Barocco style was Jean Berain (died 1711), born in Lorraine, who in an interesting way combined the arabesque motives of the Holland-German Renaissance with the grand types of the Italian acanthus ornament. Instead of the heavy scroll work he treated that band surface ornament with the graceful linear scrolls, an example of which is given in Fig. 61, and that characterized the matured stage of the Bar-

Barocco style. The preference for curves thenceforth formed the ground ideas for the internal decoration, which strongly reacted on the architectural members. Bold lines also soon transgressed esthetic laws; in the manner by which classical symmetry subordinates these, we recognize the different stages of development of the Barocco style. The late Rococo exhibits the extremest limit of this freedom as opposed to classical severity in its ultimate consequences.

When the great king, who as scarcely a second monarch exerted an overpowering influence on his contemporaries, closed his eyes, and duke Philip of Orleans undertook the regency for the still minor successor to the throne, a man that followed his unbridled temperament and gave himself to an enjoyment of life at the court, more luxurious and unrestrained, than had ever been the case with Louis XIV, who was certainly not temperate in this respect, which almost abruptly and directly introduced an entire transformation of customs. The regent held his court in Paris; his palace Royal became the scene of wild nocturnal orgies. By the example given by him in Parisian society the restraints were removed from the long suppressed passions. A general immorality strongly overflowing all former bounds was the consequence. Dishonest and conscienceless members of the Bourse recommended and conducted a financial management, which with deceptive show promised infinite riches. The mercantile system had placed the fostering and practice of art as useful and necessary. The interest in architecture increased in the highest manner. The regent himself was greatly endowed intellectually. He devoted a lively interest to art. In the severe symmetry of the late style of Louis XIV indeed he found no satisfaction. The wild arrogance by which he, the court, the state and society was dominated, demanded its own artistic expression, freed from all restraints. The development of the Barocco entered into a new phase.

The style of the regency (the early Rococo) had its path-breaking and determining artist in the court architect of the regent, Gille-Marie Oppenort (Op den Oordt), (1672-1742). His father was a Netherlandish cabinet-maker; he received his tr-

training first from Hardouin Mansart and then in Italy. There he closely adhered to the chief masters of the developed Barocco style. Already he was termed by his contemporaries the "Borromini of France". In his numerous designs for doors, windows, mirrors, mantles, cartouches, mural decorations and the like, reproduced in copper engravings, he stands nearest the known Italian masters. But he drew the outlines more carefully and thus more freely, without reference to the classical models. All is designed in relief and its principal field is the interior decoration. Oppenort believed himself to create in the spirit of the antique, yet with a freer and more energetic hand. In regard to the main lines of the decoration, he did not depart too widely from the traditions of the late Renaissance, when he retained in the great halls the subdivision by pilasters, even if in a purely decorative way. In contrast to the preceding epoch an expressed enjoyment of bold forms made itself felt. In the smaller halls and living rooms panels took the place of architectural members, and now entered into close relations with the ornament. Broad bands with elastic profiles enclosed not only doorways, windows and mirrors, but also divided the wall surfaces into panels between the wainscoting and the cornice, within which was developed a complete panel decoration, so far as they were not filled by paintings, gobelins or reliefs. Parallel to the main enclosures then first extend inner ornamental mouldings, that were again accompanied by narrow strips, which at top and bottom swung boldly around the angle and lost themselves in the manifold interlaced web of the curves of the panel ornamentation. The inner ornamental strip was soon seized by the movement. The longitudinal bands of these pass by broken angles or rounds into the side bands and are finally entirely lost in the middle lines, ending in volutes, that curve against each other; from then the ornament mostly develops in the form of palm leaves in shell-like treatment, connected with leaf motives, around which graceful main and subordinate lines are curved. Finally the centre bands are also seized on by the movement, and thus originates everywhere that peculiar animated interlacting of bands, that forms the ground idea in the most matured Rococo. (Fig. 63). Yet the evolution of

the ornament does not stop with this stage; it develops farther in its animated course. The curves soon lose their elasticity, become weaker, less restrained and finally appear only as loose curls, which are slightly held together at the points of contact. The acanthus leaf likewise loses its original form; it becomes an elongated sedge-like leaf, on which the original leaf outline is scarcely longer recognizable. The shell is a favorite element. During the regency shells are loosely inserted in the ornament as separate basins. In this, besides the influence of the Renaissance always recognizable in the general arrangement, lies the characteristic mark of the style of the regency. For with the transformation of the shell to one forming the basis of the entire ornament begins the series of forms of Louis XV.

In the evolution of the style of the regency with and beside Oppenort, Robert de Cotte (1656-1735) was highly esteemed as decorator, also as architect and took a prominent part. As a pupil of Hardouin Mansart he was at first inclined to a classical, though lighter and more graceful mode of treatment. He treated the ornament more delicately in relief, but as becoming richer in Naturalistic accessories. Over his creations appears a refined taste. Instead of the painting, he preferred to place, especially over the mantles, mirrors as an innovation much imitated later. (Figs. 64, 66, 86). Cotte was an extremely fertile artist, in whose creations one may follow the style changes from the severer classicism of Louis XIV to the matured Rococo. Fig. 64 gives an example of his mode of decoration from the last years of the 17th century. We shall farther on (page 78) become acquainted with his later style. Cotte was also an instructor and after 1699, director of the Academy of Architecture; as such he formed a school among the younger architects. A similar tendency was manifested by the likewise very important Assurance the Elder, (birth-name Gailleteau), who died in 1724, but had a greater tendency to bolder forms, richer ornamental work in relief, particularly on facades, and to unrestrained peculiar creations in the sense of Barocco treatment. Jean Baptiste Alexander Leblond (1679-1719) was allied to him in spirit and went

still farther in the problem of treating the ground plan. He required the most favorable connection possible of the living rooms with the garden, and therefore preferred one story buildings raised by a few steps above the ground. Even when the stables were to be included in the dwelling, they were to be entirely separated from the living rooms, and the same for the kitchens as far as possible, in order to prevent any penetration of odors into the occupied rooms. For the entire plan and the distribution of the rooms primarily regard for the convenience of the owners must determine. For the erection of the formerly common and usual steep roofs no reason existed, since the space thereby obtained was not required -- the owner should have no disturbing noise over himself; rather should the flat "Italian" roof be preferred. Hence since Leblond also laid down these ground principles in literary form and was esteemed a very able architect in artist circles, he permanently influenced in his sense contemporaries and later architects.

In the development of the ornament the famous painter of the early Rococo, Antoine Watteau (1684-1721) among others took part in a very great measure. He developed the grotesques of Berain further, when he enclosed his very charming idyllic shepherds and the like with the scrolled bands of Berain, but still he gave to them a more quiet course than Berain, and a more delicate relief than Oppenort. Watteau was also the artist that utilized the first systematic influences of Chinese art, that became known at that time by the mediation of the Jesuits and of the Dutch marine commerce in the West. By the extraordinary approval, that his paintings and drawings met with in the important world -- no other artist so strikingly reproduced like him contemporary society in its free thoughts and acts, the unrestrained enjoyment of life in the midst of free and charming nature -- the preference for the Chinese therefore became general, as well as for the exotic.

The mature Rococo (style of Louis XV) exhibits its apparent changes in style by the works of a master, who indeed was chiefly engaged in art industries, but by his few works and designs in the domain of architecture had a path-breaking infl-

influence, of Aurele Meissonier(1693-1750). It appears that the example afforded by Guarini (page 37) in his native city of Turin aroused the unrestrained art in design slumbering in him, and forced him into the tendency pursued by him. Meissonier was already regarded by his contemporaries as the inventor of the specific Rococo forms. He stands in the same relation to the style of the regency as Oppenort to the later style of Louis XV. The Barocco ideas as already represented by Borromini he carried to their most extreme consequences. The ground principle of the classicists he regarded as pedantic requirements of a vanquished time. The straight line was almost completely rejected from ground plan and elevation. In its place occurred curves of animated curvature. In the endeavor to be restricted to no repetitions in the decorations and to always present new charms to the eye, he rejected in the ornament symmetry in favor of asymmetry. The increasing enjoyment of nature * he expressed by the introduction of a crisp naturalism in the ornament, yet without conventionalism, since it must lead only to a pattern-like and monotonous treatment. The entire handling of the ornament experienced an entire transformation by Meissonier. For the principal motive he took the shell. As an organic object and still consisting of a solid material was this so suited to be an intermediate between plant and architectural forms. But its use resulted in Rococo ornament in an entirely free and novel manner. Its basis appears as a soft and plastic material, which spreads in the peculiar swell of the upper surface of the shell with its rows of pearls and its too thick edge, according to the main lines of the ornament in the plane, or is kneaded in the hollows, runs luxuriantly over the border and clings to it, disappearing in the most delicate relief at its ends. (Figs. 63, 67, 69, 70, 71, 86). An overflowing naturalism lends to some its special charm. Elongated sedge leaves accompany the enclosing band and grow out of the ornament or pass directly into the shell form. Natural flowers in the most charming grouping as light and elegant garlands, loose branches with fluttering leaves wind around out of the shells, fill the angles and twist about the bands. Gushing water, stalact-

stalactite forms, and unfolded wings are gracefully added in the lightly animated flow of the fanciful forms.

** Likewise in contemporary literature, particularly in Rousseau's inspiring writings and the tendency of poetry to shepherd idylls and the like, the aroused and impulsive feeling for nature finds its characteristic expression.*

This ornament was principally developed by Meissonnier in his works in the art industries. But also for its use in architecture he made (after 1726) numerous and astonishing designs, and also gave famous examples in certain architectural structures. (Page 100). A fixed system was secured by the architecture of the Rococo period through the activity of the royal architects, Robert de Cotte and Germain Boffrand (1667-1754). We have already mentioned the former among the principal masters of the regency. As successor of Hardouin Mansart and first architect of the king (after 1708), he also exercised under Louis XV for a decade a determining influence on the architecture of the court. His style tendency shows in the last time an entire abandonment of architectural subdivision of the wall in favor of panels, in which the curves predominate in ever bolder curvature, and the ornament passes from the character of the regency to that of the Rococo. In the cartouche and shell work the naturalism ever appears stronger. For wall coverings marble and stucco are less employed than wood, thereby being compelled a finer band and ornamental work. Likewise in this stage we recognize in Cotte's works that dignified elegance, which is peculiar to the Mansart school.

Boffrand is the great master of the fully matured French Rococo. He was likewise a pupil of Hardouin Mansart and a teacher in the royal Academy of Architecture, in which he represented the good principles established by Blondel. He added all the acquisitions of the French artists preceding him, had practical and correct views, and was an enterprising man, in whose artistic endowment were combined a tendency to the grand with an expressed sense for effective rhythm of the masses, for rich ostentation and splendid treatment of details. For the form of the ground plan he required in his literary

works the most thorough attention to habitability in the highest sense of the word, to convenience, to sanitation and to refined feeling. The building must in its entire appearance clearly express its purpose, and the rooms by their dimensions, in their arrangement and internal treatment must entirely correspond to their purposes and the customs and habits of their occupants. For the entire architectural treatment he required an imposing simplicity. Symmetry -- opposed to the views of Leisner -- must pass for a fixed law. Borromini's and Guarini's art style was a great sin against every esthetic feeling. The consequences of the Italian Renaissance and of Classicism thus further influenced through Boffrand.

With the ground principles laid down by him in writing his architectural works are not always in harmony. Boffrand was an artist nature too strongly inclined to rich decoration, for him to restrain this always within the measured paths of an imposing simplicity. His forms of ground plans are not seldom labored and artificial, even if carefully designed. He sometimes falls into purely ornamentally treated forms of facades, and there, where he passes all restraints, appears a stiff and often purely external distinction. In emphasizing the principal points, both in the facades as well as in the internal decoration is expressed his grandiose feeling; in treatment of details he develops an unsurpassed charm.

Boffrand had compressed his art style within definite and clear rules. With his unlimited importance as royal architect and artist, the masters leaving his school willingly adopted this art style and almost impulsively, so that the works created by them exhibit an entirely unified character. The ground plans were thoroughly worked out as if by meditation, with an expressed pleasure in round forms, certainly with constant attention to perfect symmetry in the design of the building. To the chateaus was given a previously unknown extension in length, in order to produce the most tasteful perspective effect externally. Already for this reason commonly originated one story designs. Generally only the middle and a single buildings have several stories. A certain preference for long and narrow halls (galleries) appears almost everywhere.

everywhere. The distribution of the rooms followed in the previously given arrangement. For one story structures the stairways were naturally omitted. For the external architecture new structural elements were no longer produced; for them the adoption of the Rococo style indicates a return to simplicity and plainness. The facades received a Barocco refined by graceful treatment and mostly weakened, or even a plain and quiet classicism with well profiled horizontal continuous cornices. (Fig. 88). In the ground story instead of rustication occur continuous and deeply sunken horizontal joints, which are radial in the arches of the doorways and windows. In the second story, that contains the rooms for the proper court assemblies, in the richer treatment of the middle building, it mostly receives Ionic columns without flutes, the frontispiece an order of pilasters, while the intermediate surfaces remain almost always undivided. Before the middle building, especially on the garden facade, were frequently projected balconies on columns. The pediment with the prince's arms and the crown, sometimes in bold curves, rises as an expression of festal magnificence. Not seldom all Barocco forms are avoided, and only by the adoption of ornamental details on the portals, the enclosures of the windows and the pilasters, is still indicated the Rococo. In most cases the entire exterior exhibits a flat, cold and plain treatment.

The interior then experiences so much the more a luxurious treatment. There the Rococo sets in place of pompous ostentation a coquettish grace, in which an unrestrained but also elegant and refined love of life is expressed in corrupting splendor. The ground idea of the subdivision of the wall surfaces transmitted from the Barocco and the regency is retained. But the original forms of the structural members are lost; they gradually appear as exclusively ornamental motives, in whose form treatment the statical problem is now merely indicated. Consequently also all stronger forms disappear on them. They become ever weaker and finally entirely vanish, only still forming an elegant framework in the easily moving stream of the panels, that now are intimately connected with the ornamental work, and appears as a decorative system -- in

which the forms vanish in a manner unexpected heretofore.

The use of these panels follows in an entirely symmetrical arrangement. In nearly all rooms the vertical angles of the walls are rounded. In the wall surfaces lying between them, by the doorways and windows and the mantle placed on the middle axis with the great mirror is determined the division into panels, which then receive the enclosed ornamentation already described. (Pages 74, 77). The main cornice ever becomes flatter. It finally forms merely a crowning band, rises above the roundings and the middle axes and bends in volutes around the cartouches, that are transformed into wonderfully scrolled shells. The transition to the ceiling¹ is made by means of a great cavetto (vault). In this the stucco ornaments play over the ceiling in a free and bold movement. Charming little child figures, for which Francois Boucher also (1703-1770), important as a painter and interior architect, furnished extremely attractive designs, in his numerous engravings of ornament, with flowers and emblems of the sciences and the arts, hunting and fishing, agriculture and gardening, pursue their gay sports. The ceilings receive richly colored paintings (page 19), or elegant network thrown around a widely radiating rosette treated as a shell, and whose outer ends are mostly lost in the stucco work of the vault. Thus even the ceiling is drawn into the interlaced and luxuriant panel covering the entire interior. (Fig. 70). Not only in details but also in the general lines is all relief in animated movement, fluttering as in the wind. In elegant and gracefully attractive application the stucco is modeled in free and when applied. Everything appears as a directly springing outflow of a flourishing, fanciful art imagination creating with astonishing ease. Because the ground surfaces are toned in light color like ivory, from which the panel mouldings and ornaments gently rise in white, silver or gold, and the leaves and flowers are frequently in a delicate and naturalistic coloring, these interiors have a relatively quiet and imposing general harmony. In the style and the application of the ornamental work the greatest possible attention was paid to the purpose of the different rooms. In general men sought

always to heighten the effect in the apartments designed for the court festivities, in order to prepare the guests at the entrance through the main portal for the impressions to be expected. To the vestibules was given a dignified and relatively simple treatment, kept in the monumental style of architecture. From thence grand stairways with broad steps and elegant railings lead to the upper stairway landing, which was richly treated. The principal halls adjoining this exhibit a grand and splendid treatment intended particularly for assemblies. In the smaller halls and living rooms the pomp yields to the requirements of habitability and comfort. This is the case in the furthest measure in the small chateaus in the country, that bear the names of Hermitage, Solitude, Carefree, (Sanssouci) and My Rest (monrepos) and the like. They owe their origin to the ever more deeply felt need of the higher society to reserve themselves from time to time from the enervating life of enjoyment and the stiff etiquette of court life within simpler and natural conditions. Louis XIV gave for this a model example, when at the time in which occurred the transformation in the opinions of his life (from about 1670 onward), he had erected the Hermitage at Marly and spent several days there each week. It consisted -- it was destroyed in the revolution -- of a main building manifestly influenced by Villa Rotunda, a housekeeping building detached from it, and six small pavilions, each of which was arranged for two occupants.

On these country chateaus the French garden style also attained its richest development. The type of plan of a nobleman's garden created by the Renaissance (volume 2, page 200), and by the Italian Barocco (page 24), was extended in France in the course of the 17th century to a garden architecture strongly expressed in style. The principal master of French garden art and the creator of the most important plans was Andre Lenotre (1613-1700). After he had studied the Italian gardens and had laid out those of Villa Ludovisii in Rome, he entered the service of Louis XIV, for whom he first created the gardens of St. Germain-en-Laye and Fontainebleau, and then the grand design of the palace gardens at Versailles. In th-

there a wide middle avenue of more than 3.1 miles in length, extends as the principal axis of the entire gardens, the perspective view being effectively animated by different terraces with but slight differences in height, with water basins (the basins of Neptune, of Latone and of Apollo), fountains and cascades. This main axis is crossed by a great transverse canal and by a promenade arranged directly behind the palace for increasing the perspective view of the front of the gardens. The animated effect of the water was utilized in a lavish abundance. For conducting the water were constructed aqueducts of an extent and magnitude recalling antique conduits for water. The plan of the water courses and of the walks followed a network of lines with a severely architectural arrangement, developed from the endeavor to introduce the landscape into the architectural grandeur of the palace and to subordinate it to that. Conventionalism proceeded so far that avenues were arranged between dense foliage trimmed like walls to excess in the entirety. By views of Grecian temples, artificial ruins, gateways, distant villages and rows of hills, and by the distribution of a rich decoration by statues, after definite ideas mostly derived from Greek mythology, the design affords perspective surprises of every kind and-- in the sense of the time -- luxuriant artistic charm. No architectural work of the long reign of Louis XIV breathes so evidently as this garden design the spirit of the despotic monarch, who required that even the entire surroundings of his palace should express entire dependence upon his will. The palace gardens at Versailles were esteemed the highest ideal of garden architecture and were imitated at most great and small chateaus of the Barocco and Rococo period, not only in France but in all Europe in innumerable examples.

Decorative sculpture in the period of the Barocco and Rococo styles closely adheres to that of Italy (page 17), but in the very tasteful drawing, the graceful and dignified pose of the figures, in the rich and elegant technics and the careful and refined treatment of the forms, it permits the recognition of the stylistic peculiarities of the French taste in art. Likewise decorative painting in the first half of the period

was chiefly dependent on Italian art, but it later developed a national style, particularly in the works of the celebrated Watteau, in which the spirit of the French Rococo found a striking expression. (Figs. 65, 71).

57 The minor arts reached a wonderful climax during the supremacy of the Barocco and Rococo styles, with the course of the time devoted only to show and the ornamental treatment of life. For the development of the established arts the state workshops founded by Louis XIV won a decided importance. Since in these the same tendencies appeared, which had an epoch-making influence on the architecture, also in the minor arts, and particularly in the furniture, can we follow all the changes of the style from the late Renaissance to the last stage of the Rococo. An important part fell to the smith's art, which attained its climax in the Barocco and Rococo period. It is indeed astonishing with what feeling for form and technical ability in the artistic chateaus of that time the elegant ornamental forms are wrought in the hard iron, just as if it were a material as plastic and flexible as soft wax. (Fig. 88). What these masters produced in numerous grilles and state gateways belongs to the most beautiful of all that the minor arts have brought forth.

II. Most Important Monuments.

I. Period of the early French Barocco style. *

** After having in the preceding thoroughly treated of the aims and the peculiarities of style in the art creations of the leading masters, we can limit ourselves in the following to the consideration of the monuments erected by them.*

86 Lemercier (page 62) received from king Louis XIII, as whose architect he was established after 1618, the first great commission in the extension of the Louvre. According to his design the square of the Louvre should have been enlarged to twice the present length of its sides. He erected the pavilion d'Horloge and the adjacent half of the south wing. (Fig. 53). The external facades very plainly allow the influence of Italian art to be seen. Yet on the court side the master adhered strongly to the design of Lescot. In the year 1624 Lemercier, at the command of the king, commenced the building

of a hunting chateau at Versailles. The ground plan exhibits an elongated rectangular wing, before which two square garden pavilions project on the garden side. On the other side two wings extending at right angles to the main building and adjoining its ends form a rectangular square court ("the marble court"), that was enclosed in part by a wall. The construction was executed in ordinary brickwork with cut stone for the architectural members, employing a colossal Tuscan order for the two stories. The upper windows intersect the architrave (as on the Tuileries). The middle axes of the wall spaces were adorned by busts on consoles. On the whole this design still bears the character of the French high Renaissance. The principal work of Lemercier is the church of the Sorbonne. (1635-1659); Figs. 72, 73). It presents the first example of the developed dome construction on French soil. The ground plan exhibits a central design above a Greek cross, before which on the main axis are added at each end two bays of the vaults. The choir terminates with a semicircular apse. The added vault bays are extended at both sides by two chapels. The outline of the ground plan forms a rectangle, from which project the choir apse and the entrance portico on the left arm of the cross. For the treatment of the facade Roman church edifices were apparently the models. Yet Lemercier -- in contrast to the usual architectural style in Italy -- also gave a fully developed architecture to the sides. For the form of the roof he chose the broken French hip roof, which later was generally termed the "mansard roof". The external dome is constructed without any connection with the internal one and is entirely built of wood.

Levau (page 84) was the builder of numerous city mansions (hotels), particularly the mansion Lambert de Thoringuy in P Paris, also especially famous on account of its splendid internal decoration by Lebrun and others. Likewise the excellently arranged in plan and very well preserved and treated with extreme magnificence, Chateau of Vaux-le-Vicomte (now Vaux-Praslin) near Melun (1643-1661) was by him. Lebrun was again employed on the showy internal decoration. The grand garden design of this chateau is the first important creation of Le-

Lemercier on French soil. After 1660 Leveau carried further the superstructure of the Tuileries at both sides of the middle wing constructed by de l'Orme (volume 2, page 261). The two angle pavilions of Marsan and Flore were also by him; because restricted by particular considerations, the master does not rise on them to the usual height of his artistic creations. He could proceed more freely at the Louvre, where at the same time together with his assistant and colleague Francois Dorbay, he erected the then open porticoes of the south and west wings as well as the entire east wing, whereby the square was enclosed. The wings on the whole adhered to the architecture of Lemercier. The middle pavilion of the south side however shows by the colossal order there employed a monumental appearance like a triumphal arch, indeed a festal architecture conceived as purely decorative. Leveau received the most extensive and most important problem in the rebuilding and construction of the palace at Versailles, in which the king designed to reside permanently, but which no longer satisfied the demands for assemblages. The works commenced in the year 1661 and were on the whole entirely completed in the year 1667. Leveau removed the wall enclosing the marble court of the buildings constructed by Lemercier (page 86) and he extended the inner facades of the two angle pavilions at the sides of the court by wings, that left free between them the second and wider court ("central part"). Before this middle court he then arranged a third and still larger court, the court of honor or royal court, which he included between two great wings on the sites of the old stables and subordinate structures. (Fig. 75). Thus the palace court was twice narrowed by the projections of the wings. The garden facade was extended by a new and straight line of buildings. Between the old and the advanced new facade the famous gallery of mirrors later found its place. Finally also the two outer ends lying parallel to the middle courts also received new and widely extended wings, whereby a length of 219.8 ft. was secured for the rooms. In this manner by the rebuilding of the old chateau originated a truly colossal design. The external architecture repeated that of the facades of the marble court on the

new portions enclosing the middle court. Instead of the external wings erected by Leveau on both sides of the court of honor, these originated new structures under Louis XV. The garden facade has in the ground story the French rustication (continuous and deeply sunk horizontal joints) and round-arched doorways, with a subdivision by Ionic pilasters in the principal story and Corinthian in the half story above. The long facade of the building is only animated by three projecting frontispieces, whose axes are accented by colonnades, that rise from the ground story projecting like a plinth (Fig-76). Among the further buildings of the extensively employed Leveau is yet to be mentioned the church of S. Sulpice, which he transformed (after 1655) from the old Gothic ground plan into a Barocco church with magnificent internal effect with a simple and noble treatment, yet without completing it (page 98, 235); further after 1660 with his son-in-law Dorbay he erected the college Mazarin (now Institute of France), that has on its axis a stately domed church now used as a hall for sittings. In the form of the ground plan and the structure of this extensive design may be recognized an approximation to the Roman Barocco, not apparent in the other works of Leveau.

Pierre Lemuet (page 64) has chiefly become known for his theoretical work on the plans of mansions, but he also created a large number of model structures, among which the most important were the later frequently rebuilt palace Tubeuf-Mazarin (1633-1640), now the National Library, and the mansion (hotel) Chevreuse, finely developed in plan.

An extremely rich architectural activity was exercised by Francois Mansart (page 65). Of his numerous new and rebuilt works for secular and church uses, we have to consider his structures, that were not only esteemed by his distinguished contemporaries as great artistic works, but even now must pass as marks in the evolution of French architecture. The first of these is the chateau of Maisons-sur-Seine (or Maison-Lafitte), which the master erected between 1642 and 1651 near S. Germain-en-Laye. The plan consists of a wing erected on a rectangular ground plan as the principal structure, to which

whose front side are attached two rectangular pavilions in U form, before each of which is placed a balcony structure. The principal wing has a middle pavilion projecting but moderately at both sides, which incloses the monumental vestibule, at both sides of which are arranged the stairs. The facades are subdivided in the lower story by Tuscan, and in the upper by Ionic pilasters, and the steep surfaces of the roofs being animated by dormers and by boldly treated chimneys. (Fig. 54). To the external treatment also corresponds the internal, in which the architectural division prevails in an extremely graceful treatment. (Fig. 55). The entire chateau is a classical work, even being designed more in the sense of the late Renaissance, noble and dignified in manner, which strikingly shows the French architectural spirit, and therefore merits our highest consideration. The second great creation of the master is the abbey church of Val de Grace at Paris, begun in 1645. In it the central design is combined with the nave system in a peculiar and artistically imposing way. The interior of the dome is not developed from the square but from an octagon with four large and four small sides. The longer sides lie on the axes. It is adjoined on the east, south and north by three large semicircular apses. These open on the east into the choir, treated as a smaller octagonal domed room, on the north into a square chapel, and on the south into the deep and rectangular nun's choir. At the west side joins the nave consisting of three vaulted bays, which are extended at the right and left by three square chapels with low domes on each side. In the dome piers are small round chapels accessible through doorways in the small sides of the octagon. The piers in the nave are subdivided by simple Corinthian pilasters set in pairs. In the nave from their extension above the main cornice rise coffered transverse arches, between which extends a tunnel vault. The facade (Fig. 78) recalls in its main lines that of the Sorbonne. Before the portal is placed a great portico of four columns crowned by a gable and treated in a severely antique spirit. The drum occupies the entire breadth of the nave. Therefore in order to bring the external dome into tasteful proportions with the imposing facade, the external dome must be much extended in height. It

is built of wood and its base rests at the height of the vertex of the internal shell. It was not permitted to Mansart to live until the completion of his grandly conceived work. In consequence of a certainly not happily expressed criticism by himself, he lost the confidence of queen Anna, the giver of the commission, when the building was carried about 9.8 ft. above the ground. The completion followed, after the works had stopped until 1654, by Lemuet and some other architects of less importance. Many offensive mistakes in the proportions and the treatment of the details of the upper portions of the structure were due to them. In the noble chapel of Frenes Mansart gave an example at a small scale, of how he would have executed the superstructure of the abbey church, if he had been entrusted with the completion of the building. Yet this church, even in the form later given to it, is a creation original in composition, grand in the treatment of the interior and very impressive in the general effect.

Among the theorists of this period we have to mention Jean Marot (died 1679) and his son Daniel Marot (died 1712). The former was severely trained in the sense of Mansart's school and also showed himself in his design for the Louvre facade as his most faithful pupil. He published very prominent architectural works of his contemporaries in engravings. His son Daniel attained greater importance, both as a practical architect as well as a writer on art. His great work "L'Architecture Francais" (appeared 1727-1751) is the best source for the history of architectural art at that time. He likewise occupied himself with the study of the ancient, particularly with the temple at Heliopolis (Baalbec), but gave no space to proper barocco art, even to that of Lebrun. His designs for triumphal arches exhibit a lively imagination and a rich treatment, but remain within the bounds of the earlier French art (page 111). The architecture of the citizen class follows the example afforded by the court and the nobility, even if in a more slowly progressing and constant course of development. In the foreground of the architectural interests of the citizens stand the city halls. A beautiful monument of this kind is the city hall at Rheims, that the old city of t

the coronations of French kings caused to be erected in 1627-1631. (Fig. 79). The facade has on the ground story rustication and Doric half columns, in the second being smooth ashlar masonry with Ionic half columns, above this being a luxuriantly decorated main cornice and alternating large and small dormers as a termination. Particularly rich is the middle projection with niche architecture, continuous balcony and a great roof gable. With all its richness the building exhibits a dignified and noble appearance. This favorable effect cannot be stated of the other civic buildings of the period, not even if they incline more strongly to Barocco forms than is here the case.

II. Period of the Developed French Barocco Style.

After Lebrun had returned home from Italy, he received his first commission in the decoration of the ceiling in the gallery of the mansion (hotel) Lambert de Thorigny (1649), built by Leveau, and in the internal decoration of the chateau Vaux-le-Vicomte, likewise erected by Leveau for the minister Fouquet. Louis XIV recognized on visiting this chateau the high gifts of Lebrun, took him into his service, appointed him (1660) director of the Royal Gobelin's Manufactory, and entrusted to him as a most magnificent problem the internal treatment of the palace at Versailles. There the master arranged that series of state halls in the northeast wing, partly commenced by Leveau, which are named from the mythological representations contained in the ceiling paintings, and that strikingly illuminate by their showy richness the splendor and power of the French crown under the rule of the "sun king". (Fig. 80). On the walls are marble and metal ornamentation, elsewhere predominating ivory colored stucco with heavy gilding. On the whole may be recognized in these apartments a constant enhancement of the means in art, sculpture and painting. Particular care was devoted to the treatment of the chimneys. In comparison to Italian art of that time, Lebrun retained a moderate treatment with the use of the straight line in the cornices and enclosures. The moderation of Lebrun in the employment of Barocco motives is especially evident on the Apollo gallery in the Louvre restored by him after the

rire of 1664. (Fig. 57). There instead of pilasters panels are exclusively arranged to divide the wall surfaces. The frames are entirely dominated by the straight line. The ornament is luxuriant and full of movement, modeled in a delicacy and sharpness entirely foreign to Italian art, is added gracefully to the structural members without exceeding its limits. A splendidly developed modillion cornice without breaks surrounds the room as the upper termination of the walls. Above it extends the ceiling outward as a framework everywhere elegantly decorated by relief ornament, leaving free eleven main panels, that are filled with mythical and symbolical paintings. The treatment of the ceiling allows an influence of Portona's decorations in palace Pitti to be recognized without difficulty. But the intoxication in forms of the Italians has experienced a thorough refining by the national art taste of the French. In a still more advanced sense is this shown on the last great work of Lebrun, the internal decoration of the gallery of the mirrors at Versailles (Fig. 58). The Barocco ideas are there almost entirely suppressed. Lebrun arranged in the external wall 239.5 ft. long next the garden round-headed windows between Corinthian pilasters, and the same on the internal wall, but there with the addition of mirrors instead of windows. The main cornice is richly subdivided by consoles set in pairs, the ceiling with panels in which are paintings. The ceiling is inferior in effect to the wall decoration; it was manifestly done in haste. In artistic value the very famous gallery of mirrors does not equal the Apollo gallery.

The school of Lebrun was represented by the two brothers, Antoine Lepautre (1621-1682) and Jean Lepautre (1617-1682). Antoine had erected some chateaus and mansions as the architect of Duke Philip I of Orleans. To higher fame attained his brother Jean, who published extremely rich designs for decorative sculpture and painting, mostly reproduced by copper engravings, for friezes, furniture, chimneys and the like, in which he at first adhered to the late Roman-Antique art, translated into French art taste, later into Lebrun's.

Of the works of the classicists, we have already mentioned

the principal facade of the Louvre after the design of Claude Perrault (page 69; Fig. 81). The massive facade has a middle projection and two angle projections. The lower story rests on an inclined base; besides the simply enclosed windows with segmental arched lintels and three doorways in the middle projection, it shows no further subdivision and appears as a story entirely subordinated to the principal story, for which it properly forms only a high substructure. But so much more impressively is the main story treated. It presents itself as a colossal colonnade formed by Corinthian columns set in pairs, only interrupted by the middle and side projections. The latter are each likewise subdivided by four pairs of columns. They have in the middle intercolumniations the round-arched doorways or windows, but rectangular windows with pediment caps in those at the sides, above being the impost cornice starting from the round-arched windows of the angle projections and over this medallions with suspended garlands. The last motive is repeated in the intercolumniations of the recessed wings, yet with the difference, that there are arranged niches with statues instead of windows. A massive main cornice with consoles and a continuous crowning balustrade, that is only interrupted by the low pediment over the middle projection-- without visible roof, dormers and chimneys; forms the upper termination of the structure. The Louvre facade appears as if derived from one spurt, from a happy inspiration without toil; it passed for a century as the most important work of the later architecture. Indeed it lacks all organic connection with the nucleus of the building. With all its imposing and dignified effect, it is therefore merely a purely decorative, vainglorious show piece, and hence is the true child of its time.

Francois Blondel (page 39) influenced contemporary and later architects more by his activity as director and teacher in the Academy of Architecture and his theoretical works, than by the examples given by him in his architectural works. Yet his few buildings have also found animated approval. Besides smaller works, by him is the gate of St. Denis erected by the city of king Louis in the year 1672. (Fig. 82). It is a

simple wall mass, only subdivided by a slight projection occupying almost the entire breadth, terminated above by a massive horizontal cornice with a high round-arched gateway at the middle, over which are recessed a rectangularly enclosed relief slab and spandrels. At both sides of the gateway opening stand slightly projecting obelisks richly decorated by relief ornament, whose bases are perforated by side doorways. That monument so sparing of architectural expedients, but designed with extreme power, in the midst of the contemporary buildings, claims to be a creation of the new classicism about two generations before the end of the 18th century. -- Blondel's fame passed far beyond the frontiers of France; he also passes for the original ground-laying creator of the plan of the arsenal in Berlin, which we shall consider in another place. (Page 193).

The pure classicism of Blondel, aside from some less important architects, was continued by his pupil, Pierre Bullet, (died 1718), who even in that time, in which the freer Barocco art style of Lebrun again gave the keynote of Parisian activity in architecture, in some noble works executed with refined taste, that carried into practice the art laws established by his master and instructor.

Jules Hardouin Mansart (page 71) had already developed a rich activity before the time, when he was charged with the royal buildings as the successor of Lebrun, planned at the order of the king the Place des Victoires (begun 1685) and (1699) the Place de Louis le Grand (now Place Vendôme), and had undertaken important rebuildings and new structures for a large number of chateaus and mansions. But his most important problems he received from the king in the extension buildings and the internal arrangement of the palace at Versailles. There are referred to Hardouin the royal apartments lying on the main axis of the old chateau, but later changed in part, among which the great hall of Oeil de Boeuf, so named from the oval windows in the cross walls, and the pompous sleeping apartment of Louis XIV are found (Fig. 83), and likewise the rooms of the Dauphin in the southeast wing, as well as those of the Maintenon in the left wing of the court. The

same master also substantially had charge of the Grand Trianon, erected after 1670 in the park of Versailles. This is a one story structure like a gallery with high round-arched windows between columns or pilasters with a charming treatment and a richer internal handling (Fig. 64), intended for the restoration of the royal family after the efforts at assemblages, and on which also Robert de Cotte took part (page 75). His magnificent work in Versailles is the palace chapel, that he erected beside the outer structure (from 1699 to 1710) enclosing the court of honor. In it Hardouin created the frequently imitated model of a princely court and chateau church. The ground plan (Fig. 75) forms an elongated rectangular middle room at whose end lies a semicircular apse. Around it extends a choir aisle as a side aisle. The middle aisle extends the entire height to the vaults. The outer aisle is divided in two stories, the upper one being intended for the court and therefore is treated as the principal story. Thereby it became possible for the members of the royal family to attend divine service without being compelled to use the stairs; on the other hand was thereby effected the desired separation of the court society from the people visiting the church. * The subdivision of the lower story was by rectangular piers with round arcades, the upper being by magnificent Corinthian columns. These support the well proportioned and finely designed main cornice with consoles, above which rises a tunnel vault with intersecting side compartments for the upper windows. (Fig. 60). The facade indicates by a belt the internal horizontal division of the interior and emphasizes the principal story by Corinthian pilasters. Above it extend the flying buttresses in a double quadrant from the balustrade to the upper walls of the middle aisle. These are terminated by a steep roof rising far above the other architectural masses of the chateau. Thereby is the church also characterized as such in the colossal architectural group. (Fig. 59). It is further in artistic respects particularly worthy of consideration, since the pilaster architecture on it is most closely connected with church architecture. The master's principal work is the Dome of the Invalids in Paris, completed in 1706.

Liberal Bruant (died 1897), an architect working in the tendency of Blondel, had built in 1671 the palace of the Invalids, planned in colossal dimensions. The erection of the church intended as the centre of the design fell to Hardouin Mansart. The ground plan is developed from a circular central domed area with short arms like a Greek cross with small polygonal chapels in the angles.; it forms in its outlines an enclosed square, from which project only the choir structure treated as a subordinate dome, and the projection with the main portal and the two side entrances. In the construction of the dome Mansart employed a truly Barocco motive, already used in Italy on a small scale, but here at a great scale. He arranged two shell domes, carried the lower one only to a certain height, so that a great circular opening remained. Over this dome he turned a second dome, considerably higher, whose underside was painted with figures and cloud forms in the lightest colors. This painting receives abundant light through the windows at the base of the outer dome, and which are not visible from the interior. Thus to the paintings, seen from far below, is given the appearance of reality, producing the illusion of a view into the open sky. The two inner shells are covered by another constructed of wood, whose vaulting line is drawn in an extremely elegant curve. (Fig. 85). The Dome of the Invalids, by its well conceived solution of the ground plan, the noble internal effect, the dignified external and internal architecture, belongs to the most beautiful Barocco churches of the world.

** We have already seen (volume 2, page 38, church at Schwarzhendorf), that this plan was already represented in the middle ages.*

III. Period of the Early Barocco Style.

Oppenort (page 73) by his early work, the altar canopy in the church of S. Germain-des-Pres in Paris, attracted general attention to himself. He employed on it the ground ideas given by Bernini in his at S. Peter's, but enriched the crowning volutes rising above the cornice by palm leaves supporting a world sphere surrounded by angels, thus creating a motive, that was imitated innumerable times on the altars of the later

time. In the year 1719 was entrusted to him the carrying on of the church of S. Sulpice (page 88), and which work had been suspended since 1675. His activity in relation to this extended chiefly to the internal architecture. The most important problem was received by Oppenort from the regent in the internal decoration of his favorite residence, the palace Royal. The proud apartments in which the regent gave his notorious nocturnal feasts, fell a sacrifice to the revolution of 1871. The views of those rooms published in engravings by Oppenort himself still give us a representation of their former splendor.

An expressly many-sided activity was developed by Robert de Cotte (page 75), the successor of Hardouin Mansart as first royal architect (after 1708). The earliest of his great Parisian private buildings is the nobly treated palace (hotel) de Richelieu (1704), now the Russian embassy. This was followed by palace Monty (about 1717), which was frequently altered later. On the contrary the gallery of the palace (hotel) de la Vrilliere (1713-1719), now the Bank of France, is well preserved. By it is presented to us an excellent example of the state of development of the style of decoration at that time. The walls (Fig. 86), including the main cornice with consoles, are covered with wood and are subdivided by a pilaster order with gilded corinthian capitals. Between the pilasters broad gilded frames enclose the recessed paintings. The frames have curved lines above and below. The angles of the walls are rounded and formed as niches, in which statues stand on splendid bases. The entire very long room is spanned by a tunnel vault. Transverse arches are adorned by coffers and cause a division into main panels; their imposts are marked by painted reliefs and statues. Besides the paintings in the panels of the walls and ceiling, white and gold are the predominating colors.

Lassurance the Elder (page 75) was an artist chiefly esteemed by the nobility, who built numerous grand mansions. Leblond (page 75) was likewise active as an executing architect, but is particularly known by his theoretical works.

IV. Period of the developed Rococo Style.

Of Robert de Cotte's works, there belong to this epoch some apartments of the palace at Versailles, the rooms adjoining the sleeping chamber of Louis XIV; the salon de conseil, a portion of which is represented by Fig. 66. The similarly treated sleeping apartment of Louis XV and the two succeeding rooms, as well as the brilliant apartment designated as the cabinet of Louis XVIIth which contains the richest and finest treatment in this series of rooms and represents the last splendid work of Cotte. Cotte was a highly esteemed architect and an extraordinarily fertile designer, who not only executed important works in Paris, but also in other localities in France (in Verdun near Metz and in Bordeaux), and was likewise employed by princes outside the French frontier for creating plans of chateaus or in an advisory capacity. (Page 187). In Strasburg the magnificent bishop's palace was by him, erected for the prince bishop Cardinal de Rohan in 1728-1741, a U-shaped structure with three wings and with a very finely handled enclosure of the court like a gallery with an elegant curve inward. (Fig. 87). The stately building is now utilized for the purposes of the university.

To the style tendency cultivated by Cotte in the last years of his life also belongs that of Francois Boucher and Vanloo in the chateau of Fontainebleau, which by its free decoration, the graceful treatment of the details and the finely conceived coloring is to be counted with the best works of that time.

Meissenier (page 76) aroused very great attention by his first important work in the domain of architecture, his design for the principal facade of S. Sulpice (1732). In a preference for curves in ground plan and elevation, as well as in the charm of novelty in regard to the decorative treatment, this surpassed even Borromini's works, but replaced the dry heaviness of Italian architecture of like tendency by a graceful coquetry in the over fineness of the members and by the sportive lightness of the ornamental work. Thereby in this design so entirely breathes the spirit of the French Rococo. It was never executed. We shall take up the building yet later. (Page 235). Likewise as a practical architect, Meisson-

Meissonnier produced great works in his famous house Brethous in Paris, in reference to the utilization of the entirely irregular and trapezoidal architectural surfaces, skilful distribution of rooms, comfort, and pleasing as well as splendid interior decoration.

Boffrand (page 78) was less in the service of the royal court than in that of the nobility and of foreign princes. Of his Parisian buildings, the mansion (hotel) de Montmorency is first merits consideration. The buildings are arranged around an oval court. The two story main building lying on the axis has a colossal order of pilasters; the adjacent one story wings are subdivided by Tuscan pilasters and round-arched arcades. The use of this colossal architectural expedient on the facades of a structure, in whose internal architecture almost every structural idea is suppressed, is characteristic of the change in the conception of art prepared in Boffrand's works. Certainly the strong influence of the Academy of Architecture pressed toward this. Boffrand's chief creation is the internal arrangement of the palace (hotel) de Soubise and that of de Rohan (now National Archives) in Paris, rebuilt and united by Belamire (died 1745). (Figs. 87, 89, 70, 71). These present the most splendid example of the French Rococo in its most complete maturity, especially in the pompous oval hall of the ground story, though treated with the most refined feeling for form. Among the church buildings of Boffrand, the cathedral in Nancy takes the most important place; it is a domed church over a Latin cross, where the three short arms end in semicircular apses. The architectural treatment is simple, noble, and in severe drawing, which however permits the recognition of a certain approximation to the contemporary Italian Barocco.

Of the contemporaries of the great masters employed in Paris, Jacques Jules Gabriel (died 1742) still deserves mention, an architect much employed in private architecture at Paris, Nantes and Rheims, as well as a bridge constructor; Charles Etienne Briseux (died 1754), who is known less for his architectural practice, than by his three great works on architecture (appeared in Paris in 1728, 1743 and 1753), in which

he represents the style changes from the regency to the new classicism, and in Lorraine Emmanuel Here de Corny (died 1762), the builder of the great Place Stanislaus and of the city plan around it at Nancy. The Place Stanislaus forms a rectangle of 410.1 × 344.5 ft. The entire south side is occupied by the former ducal palace, now the city hall; the other sides are bordered by the palace of the archbishop and by smaller mansions. All entrances to the streets are closed by high wrought iron gates, which were executed with unequalled mastery by the art smith Jean Lamour (Fig. 88). The art style of the master last named entirely remains within the tendency shown by Boffrand.

To the supremacy of the Rococo style was assigned a comparatively brief duration. The rude contrast of the theories of the French masters with their architectural works already about the middle of the 18th century led to a separation, and produced an entire change in the antique ideal, which we shall later follow more closely.

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4. Architecture in the Period of the Barocco and Rococo Styles in the Netherlands.

I. Historical Development and Style.

The Netherlands in the 17th century entered on an elevated stage of art, such as but few examples of like fertility and on a similarly limited domain are presented in the history of art. This is indeed true of painting in the first line. But architecture also took a large part in it. It affords great interest in the history of art, because it gave a striking national expression to the character of the people and the prevailing religious and social opinions on such a small area.

The contrast already observed in the period of the Renaissance between the southern and northern Netherlands (volume 2, page 283) became apparent in greater measure, after the political separation was determined by the peace of 1609, and particularly after the northern Netherlands had obtained their recognition as an independent free state. (1648).

The southern Netherlands, whose frontiers in general agree with those of modern Belgium, remained faithful to Catholicism. the population chiefly consisted of Flemings and Walloons, very gifted artistically and particularly receptive to the influences of the counterreformation. Among them the artistic endeavors last extended and required by the taste for external conditions, found a fertile soil. Under the careful reign of the infanta Isabella (1598-1621), the daughter of Philip II of Spain, Belgium formed an independent state, which developed a strong and individual life. The infanta had increased the prosperity of the country and devoted especial attention to the culture of the sciences and arts, but also no less to the furtherance of Catholicism and its church activity. The iconoclasm was succeeded, both at the court and among the great of the country, and also by the guilds and the citizens, by great sacrifices for the satisfaction of the increased and extraordinary requirements for church art works, and for the erection and rich equipment of churches and monasteries. The country entered on that splendid epoch, which received its highest artistic illustration by Peter Paul Rubens, the prince of painters. (1577-1640).

Rubens also took a strong part in the development of architecture. He was eight years (1600-1608) in Italy, from his 23rd to 31st years -- at a time that must have definitely influenced his artistic tendencies, and not alone in upper Italy, but also in Rome and Naples, and even in Spain; thus he was acquainted with the later art of the south as well as with that of antiquity. It is characteristic of his art in design, that he devoted his chief interest to the Genoese palaces, particularly to the buildings of Alessi (volume 2, page 233), and that he drew them and published them in copper engravings. * this work passed through four editions; from this may be estimated his influence, that it had on the architecture of that time. Rubens held the Genoese mansions to be much more suitable models for those of the Netherlands, than the Florentine palaces. He was a man of refined culture, whose importance as a political citizen with a statesman's broad outlook stood as high as an artist. In his works is manifest a classical training in combination with the aspiring imagination of the easily excited and spirited son of the southern Netherlands, abrupt gaiety, and as an element of the strongly Germanic portion of the blood of the nation, the enjoyment of a showy treatment of certain architectural parts. He strikingly personifies the individuality of the strength of the Netherlandish people, that indeed willingly adopted Italian impulses, but gave to them new forms and harmony.

* *Palazzi di Genova. Antwerp. 1622. Later editions of 1633 in Antwerp, of 1708 and 1655 in Leipzig.*

Partly compelled by adherence to existing plans, church architecture first continued the ground plan of the mediaeval churches; a three aisled nave with high middle aisle and low side aisles, sometimes with a wide transverse aisle also, a choir with apse and at both sides smaller apses as terminations of the side aisles. The pure central building only occurs as an exception under the influence of foreign impulses. It later appears in a peculiar combination with the nave structure. One peculiarity of the Belgian churches is the position of the tower on the main axis directly behind the choir. (Fig. 90).

For the internal structure, indeed under the influence of Genoese architecture, columns were preferably employed instead of piers. They support arcades, in whose spandrels were inserted curved consoles as supports for the transverse arches above the broken cornice. The vaults were also frequently furnished with ribs. The internal architecture entirely omitted the subordination of the masses and members to the great idea of unity, as it is shown in the Jesuit style. The Flemish masters did not feel themselves bound by architectural severity; they were not even accustomed to it. In their creations prevail the picturesque element, freedom in the treatment of the members and the enjoyment of primitive baroque forms above the restraints of academic correctness. The comfort lent to dwellings and city halls by wooden paneling, they sought to obtain for their churches, when they covered the lower portion of the walls by richly carved paneling with splendidly treated confessionals and choir stalls. The chief show pieces of the Belgian Baroque churches were the pulpits adorned by the most labored ornament in relief. (Fig. 91).

The facades (Figs. 89, 90) are arranged in three divisions corresponding to the division of the interior; they have a high and middle and low side structures, which above their attics are joined to the middle building by a curved volute in the form of a horizontal console. For the members with all the width of the general design, the upward aspiration is characteristic. Heavy groups of columns and pilasters bear similar and frequently returned cornices; animated forms with boldly broken lines and moulded in relief enclose the windows and niches. Greater preference is enjoyed by the boldly treated gable as a cap over doorways and windows and to crown the middle aisle, and but exceptionally the facades of the side aisles. In elegant obelisks of candelabra form entirely reappears the upward movement produced by the vertical axes. The towers appear as free creations of northern art. They rise on a square substructure covered with rustication, 106 in two stories with Doric or Ionic angle pilasters or with angle columns and niches, then passing into an octagonal story, which receives its termination in a dome with a lantern.

The members exhibit the luxuriant power; they were extremely fanciful and were developed with entire freedom. On the whole they appear as if they were produced by a direct mixture of the northern Renaissance with the tumult of forms of the advanced Barocco style. (Figs. 96, 92). It is striking, that in Belgium already in the first quarter of the 17th century in the recurved and rolled caps, the jambs curved in and out, and in the entire treatment of the portals appears a bold play of lines and forms, such as the contemporary art of Italy cannot exhibit. The first principal master of the Belgian Barocco style, Jacques Francquart (page 112) had published well considered models for these in his "Libre d'Architecture" issued in 1617. Borromini's and Guarini's designs fall in a later time. In any case the art of the Netherlands did not bring these forms from Italy; rather is to be considered the reverse, that Borromini received influences from Francquart's designs for his endeavors to excel Bernini. On the other hand and based on the political relations is probable a connection of this style of Francquart with that of Juan Gomez de Mora, then the superior architectural official of Spain. (Page 48). The appellation of "Spanish deurkens", which these fantastic forms of doorways have received, directly indicates this. But the Belgian master has gone still further in the boldness and the impassioned treatment of the forms, than the Spaniard. The ornament at first consists of heavy and sappy acanthus scroll work in combination with luxuriant festoons of fruits, cornucopias, the grotesques of the Renaissance and dry figure ornament in relief. About the middle of the 17th century an influence on Belgian art is obtained by the rolled gristle or ear style of the German decorators, that gave to the scrolls a soft form, as if kneaded from dough, recalling the rounded form of the external ear. (Volume 2, page 277). The further development of the style of ornament follows in adherence to the Barocco ornament of Germany. But the luxuriant and animated modeling applied in swelling relief remains as a Belgian peculiarity.

In secular architecture the most important place is occupied by the city and guild halls. The design of the ground pl-

plan of the former permits the influence of the Barocco style to be recognized in the enlargement of the rooms for vestibules and stairways. The facades and the decorations of the halls intended for assemblages have a treatment like palaces. But the guild halls (Fig. 93) as a rule still retained the traditional high building with the narrow facade having three or four windows and several stories above each other. The latter were treated with great richness and finished with the new forms in the most varied ways. (Page 116; Fig. 100). Still more strongly did the houses adhere to the old traditions. Even after 1625 such originated with stepped gables, high facades, and even with pointed arches. The influence of the new art is there chiefly expressed in the more convenient arrangement of the ground plan, the broad stairways and in the erection of court structures for the subordinate rooms. A real palace style was never developed, such as Rubens desired to produce.

In Holland, the present kingdom of the Netherlands, the Germanic race, holding fast to the peculiarities of their race, ably calculating in its enterprises but bold and led by mercantile considerations, not only won its complete political independence but also its freedom in belief after hot contests. In it Protestantism found a secure and well protected home. After the recognition of the free state of the Netherlands as a sovereign power by the peace of Westphalia (1648), the Dutch also exhibited in their victorious wars directed to the conquest of colonies, an unusual power of expansion, by which they extended their commerce over nearly all parts of the earth. From distant lands its bold mariners brought home immense riches, which under the blessings of peace permitted a comfortable development of living in the most extensive classes of the people. The entire national and cultured life received a grand and worldly tendency. To this was added, that a philosophical spirit, that had in the two recently erected universities the strongest starting points and supports, not only dominated the nobler men of the nation, but also the citizen class. Men busied themselves thoroughly with the study of the ancients. The influence of the Italian Bar-

Barocco art, that had struck such deep roots in Belgium, found no ground there. The people were prejudiced against the specific Catholic character of the Belgian style; their art in design was different from that of the Belgians. The abrupt contrast in painting between the churchly and devotional picture of the southern Netherlands (Rubens) and the realism of Holland (Rembrandt) was also expressed in the architecture. Dutch architecture remained faithful to its tendency developed in the Renaissance.

The style treatment is most severely calculated and consequential. Men first required the rooms and their distribution to correspond to the purpose of the building, and certainly in this went to a utilization of the rooms carried to the extreme, also particularly in the dimensioning of the subordinate rooms. Further was required a good and secure construction. (The city hall of Amsterdam is founded on 13,659 piles driven into the ground). In regard to the architectural treatment, men strove for a quiet appearance, carried out in the classical sense. It was entirely conceived in the sense of the theorists, when the art of the ancients was regarded as the ideal model of pure treatment of forms. Architectural itself passed for a science, which firmly restricted artistic creation by law and rule. The works of the severe Palladio were celebrated as the highest manifestation of the art spirit; the Dutch had adopted his instruction more fully, than any other people on this side of the Alps, excepting the English.

In the architecture (Figs. 94, 101, 103) the classic orders came to unlimited supremacy. Between the strikingly close set columns could not be developed the strongly emphasized window architecture of the Belgians; the architraves of the narrow and tall windows are rather very modest, and the moulded jambs and lintels are often entirely omitted. The scrolled gables of the preceding period were also omitted, as well as their decorative richness. All details, the cornices, the bases of columns and the capitals received a severe classical design. As ornamental forms are sparingly found as filling gable panels almost entirely, loose festoons of leaves and f

fruits, and the Roman scroll frieze with reliefs of figure representations or emblems employed in parapets.

Besides this classicism the Rococo did not occur. Into the capital Amsterdam it appears in general to have found no entrance, and in other places like Rotterdam and Groningen it only led to certain decorative accessories, that were directly and obtrusively applied by foreign modelers to the facades otherwise left entirely unchanged. (Fig. 95).

In the design of the ground plans of this structure, new and characteristic types for the epoch did not originate. Protestant church architecture did not develop a special activity, since the need for the Houses of God was satisfied in great part by the already existing buildings. The few churches meriting consideration have a central design in the form of the Greek cross, of the polygon or the circle. The plan occurring in one case * of a hall with apsidal extensions on the longitudinal axis and of two axes at right angles thereto, indeed brought an interesting and artistically important solution of the problem of church architecture, but found no further result.

* *New Church* at the Hague, built in 1649-1655.

Secular architecture produced in the city halls some very important creations with in part masterly treated distributions of the ground plan in accordance with the special requirements for the city administration. Chateau architecture received no proper development in the republican state. On the buildings originating about the end of the 17th and in the first half of the 18th century, the ground plan allows the recognition of French influences, and also the internal decoration. The exterior almost always exhibits the form treatment of the public secular buildings. They mostly reject architectural ornamentation, even if also on certain of the better structures a great pilaster order and also occasionally galleries occur. By the mixture of bricks and cut stone, the latter being employed for the plinth, angles, bases, capitals and cornices, while the shafts of the pilasters and even the window architecture are constructed of bricks or moulded bricks, these buildings having a peculiar charm.

About the end of the 17th century Dutch architecture was fertilized by the influence of the Huguenot immigrants from France in multitudes in consequence of the revocation of the edict of Nantes (page 123). Among them was found the important Daniel Marot (page 90), who was appointed his chief architect by the stadtholder, William III of Orange. The Huguenots represented the graceful classicism developed in France, that received its perfection by Francois Mansart. Their art clarified that of the Netherlands in the sense of a more graceful pose of the entire architecture, as well as a refinement of the details. But likewise their own uninfluenced creations acquired there a Dutch coloring. From the intermingling of the two art conceptions proceeded a style tendency, that attained to high and instructive importance far beyond the frontiers of Holland. It expressed itself with particular prominence in city and garden architecture. The Dutch by the nature of their country were ~~early~~ led to make the soil arable by drainage, thus to the construction of canals, to suitably plan the cities, and also to garden architecture in connection therewith. Their sense directed toward the practical taught them to arrange the cities chiefly according to engineering views:- they divided the available land by broad and straight streets into rectangular blocks. The houses themselves are made wide and mostly with but two stories. The corners of the street intersections were preferably emphasized by three story buildings. The ground plans have great anterooms on the street facades with galleries or balconies on the courts. The architecture of the houses retains a plain simplicity. Only the portal is frequently accented by pilasters or columns. The windows have simple architraves and the angles ashlar quoins. Instead of bay windows appear balconies. The covering was by mansard roofs. On the whole the buildings have a quiet and classic pose. The public buildings, such as city halls and mercantile houses, exhibit the same ground tendencies, but are more richly treated. There are also found decorative and figure reliefs. For the ornaments is characteristic the preference for their division into panels, such as the later classicism shows. The chateau build-

buildings of the Huguenots are very much extended in width by reason of an intimate connection with the garden design and the prespective effect of the structures. From a middle building with one or three wings extend long one story structures, that terminate in higher portions. The architecture remains within the limits of a tasteless, academic uniformity, which only rises to a richer effect on the middle portion of the principal building, yet without manifesting a higher flight of fancy.

In garden designs the Dutch developed a peculiar style, that essentially differs from that of Lenotre (page 83). By the grand arrangement of walks, cascades and the like, this always placed the entire garden area in direct connection with the architecture of the chateau. But the Dutch certainly preferred a subdivision into geometrical plots by straight lines, which indeed also received some variety by modest water works, grottos, arbors, and shady walks, and also in part by statues and small structures, but by the rejection of the great groups of trees in favor of beds of flowers and of a wide view over the area of the garden, produced the impression of a certain emptiness. This design ~~corresponded~~ well to the Dutch, who were accustomed to a broad view of the landscape, and found pleasure in strict geometrical accuracy, but they are very much inferior in effect to the French Barocco gardens, expressing a unified artistic idea. Yet in spite of this the Dutch garden style also often found entrance outside the country, particularly in north Germany.

II. Most Important Monuments.

BELGIUM. -- The principal master of the early Belgian Barocco style, Jacques Francquart (1577-1651), who was originally a painter and had traveled in Italy, commenced his epoch-making activity in Brussels with the Jesuit church (1606-1616). This was -- it was torn down in 1712 -- a three aisled nave without transverse aisle, but with semicircular apses, round-arched arcades on Tuscan columns, and a facade subdivided by pilasters, whose treatment exhibits the transition from the Renaissance to the Barocco. Soon afterward originated the Augustinian church at Brussels (1640-1642), which unfortunately

had to give place in very recent times to the main portal building. It had the same ground plan as the preceding * and a notable, extremely ~~clearly~~ arranged and impressive facade. The lower story in accordance with the internal subdivision was three aisled with broad pilasters and columns set before them, the middle building two story and flanked by doubled columns, the lower being a Tuscan colonnade with a broken triangular pediment, the upper being crowned by a similar segmental gable. In the doorways and windows were enclosed with in curved and returned lines with bold mouldings, covered by broken gables. Only the uppermost portion between the shield of arms added above the great cartouche between the projections of the segmental gable, had a closed angular cap.

* Several Barocco churches of Belgium appear to have been erected on mediaeval foundations.

To the school of Rubens is due the origin of the grand church of S. Charles, formerly the Jesuit church at Antwerp (1614-1621). The design is evidently referred to Rubens himself, but the execution was conducted by the Jesuits Francois Aguilhon and Pierre Huijssens. The ground plan is that of an Italian columnar basilica with three aisles and without transverse aisle. Each of the aisles terminates with a semicircular apse. Behind that of the choir stands the tower, which was destroyed by fire in 1718, but was again rebuilt according to the old design. The interior has a simple and clear, solemnly cheerful treatment ~~with an~~ excellent effect of the light, which charmed several painters to reproduce it by paintings. The facade (Fig. 89) is broadly arranged in three parts with two story elevation, above its middle portion projecting a third story crowned by a pediment. In the facade are included two flanking recesses extending through two stories, each of which is crowned by an octagonal domed structure like a loggia. The subdivision is effected by pilasters, instead of which columns occur at both sides of the middle axis and at the angles. It is grandly conceived, powerful in expedients, of extravagant richness, and in the Barocco heaviness is freer and more advanced than the contemporary works of Italy. A work of this time and of importance in the history of art

is further the rebuilding of the abbey church of S. Peter at Ghent, begun in 1629, erected by Jan van Xanten (Giovanni Vassanzio). The master there placed in a three aisled Romanesque basilica a central building above the Greek cross with a main dome and four subordinate domes over the angles between the arms of the cross. The building is entirely treated in the Italian sense. Its facade has many characteristics of Vignola's design for the church Gesu in Rome. In comparison with the other Belgian Barocco churches it exhibits a somewhat dry and tasteless treatment. Yet more closely adheres to Italian art Wenceslav Coeberger (1560-about 1630). He was a painter, had been trained in Italy, then entered the service of the archduke Albert and showed himself in his architectural activity as an opponent of the free art conceptions of Rubens and as zealous for the antique tendency. His principal work is the great church of Notre Dame of Montaign (about 1610), a central structure, whose ground form strikingly coincides with that of S. Maria della Salute in Venice. (Page 37). A slender tower stands beside the choir. In the architectural treatment the horizontal subdivision appears in a heaviness foreign to the northern nature.

The second great master of the later Belgian Barocco was Lucas Faydherbe (1617-1697), the favorite pupil of Rubens. As his earliest work we have to consider the church of S. M Michael, formerly the Jesuit church at Louvain; * (1650-1680); this is a three aisled cross plan kept within the proportions of the late Rhenish Romanesque cathedrals with three middle and six side square bays, transverse aisle and three apses. Ionic columns, that appear too closely set for a Barocco building, support the arcades. The cornice extended above them is strongly returned above the consoles, that rise from the spaces between the cartouches. A tunnel vault and a low dome over the crossing forms the ceiling of this building. The internal architecture is executed in gypsum, stucco and exhibits the most luxuriant forms. The imposing triply divided facade is one story before the side aisles, two story or rather two and a half stories on the lofty middle building, if one counts in the crowning addition with the colossal tablet

of arms. At the outer angles are coupled pilasters, and at both sides are grouped similar columns, indeed Ionic in the lower and Corinthian in the upper story, hermes being used in the added gable. The powerful mouldings, the numerous returns, the rude Barocco doorway and window enclosures give the building a strange rhythmic heaviness, that receives a particular artistic clarification by the animated and heavy relief, and ornamental work enhanced to the most luxuriant splendor in the tablet of arms of the added gable. The quite strongly upward tendency of the facade, which is only moderately softened by the rusticated bands, which intersect at each third of the height of the column, and not last these bands themselves characterize the building as an expressed work of the northern Barocco style. The pulpit already executed in 1699 (F (Fig. 91) now stands in S. Gudule at Brussels. Then in a still higher degree characteristic for the master must pass the Beguin church at Brussels (1657-1676), a rebuilding of a three aisled cross basilica with a hexagonal tower adjoining the middle apse. The interior has a charming effect through the noble and strong treatment, excellently adapted to the old building. (Fig. 97). The facade is well known as a show piece of Belgian architecture. The strongly accented triple division allows the internal treatment to be clearly recognized. (Fig. 98). The middle building has two stories and a crowning gable on the added story. It is subdivided in the lower story by Ionic clustered piers, in the upper by Corinthian half columns, and in the added story by hermes. Over the portal the architecture of a niche interrupts the main cornice, so that its terminal function here appears omitted, corresponding to the undivided middle room. The adjoining facades of the side aisles have coupled pilasters at the angles and independent gables above the attics instead of the elsewhere employed great volutes. Thus also here the axes are completely extended upward; the entire subordination of the facades of the side aisles to the middle building is omitted. The architectural treatment of the details appears as an interesting result of a genuine Barocco architectural tendency, that understood how to combine the system of the Italian Barocco sty-

style with the northern structural principles and the powerful form treatment of the Netherlandish Renaissance. One will not err, if at least the design for the facade be ascribed to Faid'herbe.

** The assumption, that this church is to be attributed to the Jesuit father Wilhelm Hesius is uncertain, according to my understanding. Such a grandly conceived, unified and powerful work, executed as if at one spurt, could only have had a great master as its originator.*

The master not only understood how to transform the shapes of earlier buildings in the modern sense; he also approached more nearly to the problem of the central building, and he perfected solutions meriting consideration in the highest degree for the combination of the central building with the nave, and indeed even then, if he saw himself restricted in the free development of his ideas by regard to existing structures. In the church of Notre Dame of Hanswyck at Mechlin (1663-1678), he inserted in the three aisled nave design a circular domed building, about which the side aisles are carried concentrically. (Fig. 98). Likewise in his smaller church buildings and the partly never executed designs, the master shows himself in the design and in the architectural and ornamental treatment -- he was also very much esteemed as a sculptor -- as a very important representative of his time.

An example of dwelling houses is afforded by Rubens' own house. (Fig. 99). The great painter, as a well to do and highly respected citizen of his native city, was indeed in a position to give to his own house a richer artistic treatment. But in the design he departed but little from the native traditions and did not elevate the treatment of the facade to architectural importance. On the other hand the paintings give it an innate charm. The gateway terminating the court and forming the entrance to the garden, exhibits the architecture of a triumphal arch with three entrances, the middle one rectangular with oblique corners, those at the side terminating in round arches. Over these lies a low story treated with niches having busts, and with a low triangular roof over the middle passage and a crowning balustrade attic with stat-

statues on the two inner and vases on the two outer axes of the piers. Half columns project from the piers of the lower story, which are intersected by bold rusticated bands. The side entrances have smaller columns arranged after the Palladian motive. The treatment exhibits a primitive and almost rude strength. Splendid guild houses with most luxuriant ornamentation conceived in reference to the different industries are found at Brussels (Fig. 93), Antwerp and Louvain, etc. The palace-like corporation house (Fig. 100) erected at the order of the mechanics by A. de Bruyn in 1698 has already abandoned the traditions of the native gabled house. Its entire design and architectural treatment gives the impression of a new architectural spirit inclined to Dutch classicism.

HOLLAND. -- Among the leading Dutch masters is to be named Jacob von Campen (died 1657) in the first place. He had devoted himself to painting in Rubens' studio, was then in Italy and after his return to Holland, turned to architecture. On one of his early works, the house of Balthasar Kayman in Amsterdam, distinguished by grand and clear proportions, but otherwise very simple, and which exhibits an Ionic and a Corinthian order with a high attic, with windows in the intermediate rooms with stone crosses, simple architraves and caps, the influence of the school of Palladio makes itself apparent. Particularly all richness of ornamental decoration is avoided. His principal work, the city hall at Amsterdam (after 1648), is the most important work of Dutch architecture of the 17th century, in which its peculiarities are most markedly expressed. On it Campen shows himself not only in the architecture but also in the solutions of the ground plan and the construction as a great master of his profession. Within a length of 262.5 ft. and a width of 206.7 ft. he developed a ground plan, in which the different rooms were distributed in a masterly way with a thorough understanding of the diversified requirements of the administration. The principal apartment is the great rectangular citizens' hall, arranged on the middle axis and extending through the two principal stories. It is entered through the vestibule and the relatively modestly treated main structure in three branches -- two lower ones to the lan-

118 landing and a middle ascending upper branch. At each side of this hall lies a court with wide galleries extending around it and with other stairs in three branches at the side opposite the citizens' hall. Toward the market place projects from the main facade a wide middle building composed of seven axes; at the angles rise narrow projections with three axes each. The recessed parts have five axes. The superstructure (Fig. 94) shows on a low ground story, treated as a plinth, which contains the entrances in the seven round-arched doorways of the middle projection (a main portal does not exist), two principal stories, over each of which is inserted a low intermediate story. Closely set Composite and Corinthian pilasters subdivide the facade, each comprising a principal and a low intermediate story. The rectangular windows in the main, and square windows in the intermediate stories have no architraves. Only simple festoons (of leaves) in the pedestals of the intermediate stories form a simple and dignified decoration. The middle building is crowned by a pediment with rich relief of figures in the tympanum and statues as acroterias. With similar severity are treated the interiors. The great citizens' hall (Fig. 101) repeats the external architecture exactly in the lower story, in the upper with a variation. The ceiling is a tunnel vault with a division into rectangular panels and paintings on thin backgrounds. The doorways of the hall in front are characterized by crowning relief ornament. The details are not superior to the best Italian and French in correctness of form and refinement. Quite particularly beautiful are the sculptured works of Quelljusus, whose caryatids in the vestibule and figure reliefs of the tympanum of the facade must pass for works of the first rank in composition and execution. (Fig. 102). The ornament is free from all Barocco tendency; the favorite naturalistic festoons of fruits employed rather bear the character of the Renaissance than of the Barocco. On the entire architectural work is impressed with a fully intelligible clarity the character of a statehouse for the independent government of a great democratic community. Indeed to its present use as a royal palace so much the less is given an external expression.

After Campen, Pieter Post (1608-1669) was the most employed Dutch master of the 17th century. His earliest works were in Brazil, where he went in 1636 with prince Maurice. The church and other buildings of Olinda and the fortifications of the city of Pernambuco were by him. The palace Maurice (Mauritzhuis) built by him at the Hague charms one by its noble and indeed classical facade (Fig. 103), adhering to the Italian late Renaissance. More strongly expressed is the Dutch style in his most important creation, the city hall at Maastricht (1652). The plan is very worthy of consideration and contains on the middle axis a great square hall, that extends through both stories and the attic and is covered by an octagonal dome like a tower. Adjoining the facade are the stairway and the vestibule, at the opposite side being a second octagonal hall, which likewise occupies two stories. Around the two halls extends a corridor on each of three outer sides. (Thus not on the division wall). The official rooms are arranged about the main halls lengthwise of the building. Before the middle projection is placed a flight of steps with balcony above a portico; it is elevated by a roof story above the adjacent wing and crowned by a gable. Otherwise vacant and returned pilaster orders subdivide the building, between these being placed the tall windows without architraves.

/20 The third Dutch architect of that period, Philip Vingboons (1608-1675), owes his importance in the history of art chiefly to his literary activity. In his writings he required besides a treatment of the interior accurately restricted to the purposes of the buildings and substantial construction, a purely scientific conception of architecture with a close adherence to the antique. His palace Tripp (Trippenhuis) in Amsterdam (1662) has some large halls and strikingly small subordinate rooms. The facade is subdivided by a colossal order of eight very closely set fluted Corinthian pilasters. These stand on the ground story, treated as a plinth, and comprise the two principal stories and the upper mezzanine story. The four middle ones form a slight projection, over which rises a pediment with arms and trophies in the tympanum. The windows lack separate jambs. The pediments and caps project

but little. The principal cornice is animated by a severe pattern-like designed scroll frieze with very meagre foliage. Otherwise festoons of leaves form a relatively rich ornament. By these the building occupies an exceptional place in Vingboons' art. His other works, even if they generally strive for a richer effect, mostly exhibit a very tasteless and stiff subdivision with unassuming pilasters.

Protestant church architecture is represented by two works meriting consideration. The Lutheran church in Amsterdam was erected in 1666-1668 by Adrian Boorsman, who adopted the motive of the ground plan of the antique theatre. (Fig. 104). It is the only older church in Amsterdam with galleries built in. On the three polygonal piers and eight Ionic columns set in pairs next the entrance side rest the massive internal main cornice, above this being a low dome with coffered dome and lantern. On the exterior the building appears in front as a dome constructed on a regular octagon with two narrow recesses terminating with the principal cornice, as facades of an annular aisle, which extends around five sides of the octagon. The acoustics of the church interior are excellent. The exterior makes a dignified impression, and not that of a theatre. The Ooster church in Amsterdam was built in 1669-1671 by an unknown master, and it has the ground plan of a Greek cross with two intersecting tunnel vaults and low square rooms in the angles, so that the area covered forms a square with a projecting entrance hall. Galleries are wanting. The exterior bears a churchly character. By the facades of the arms of the cross, carried high above the main cornice, the high hip roof and the lantern over the intersection.

Of the more important architectural monuments erected in the 18th century, there is yet to be mentioned the chateau Heerenloo built by Marot (page 111), whose plan was manifestly influenced by Versailles. The structures are grouped around a court of honor narrowing toward the rear by offsets. On the axis lies the vestibule and behind this is the stairway in three branches, that has its considerable richer model in the ambassadors' stairway at Versailles. The decoration was simple and severely treated, mostly executed in wood, to whi-

to which was given an appearance like marble by painting.

The later Dutch-Huguenot art may rise to greater importance on account of its extension, than that of the second half of the 17 th century. But considered in itself, this earlier p period is that one most interesting in the history of art. If one views the stylistic general impression or its works and observes the cold and stern severity of the orders, the tasteless and stiff forms of the other architectural members, and particularly the ornamental work, the quite pattern-like designed acanthus frieze and festoons, one might imagine himself to have before him creations of about one and a quarter centuries later. This style is the direct predecessor of the new classicism from the end of the 18 th and the beginning of the 19 th centuries, particularly of that style generally designated as "Empire".

5. Architecture of Barocco and Rococo Style in Germany, Austria and Switzerland.

I. General Basis.

The German Renaissance in the buildings of some prominent masters, who had become acquainted with the Barocco style in Italy, had developed strong tendencies to an independent German Barocco. According to the treatment of the forms, these works on the whole still belong to the Renaissance. Yet they differ from this by the great monumental tendency characterizing the Barocco conception, and which was undeniably aimed at. The thirty years' war removed the ground for a further development. Activity in architecture flourished well under the favor of special conditions in the provinces not affected by it or less severely involved, until about the year 1630. But in the second half of the war occurred generally those miserable conditions, which destroyed the extraordinary wealth of the country, introduced depopulation, poverty, a habitual and intellectual decadence of the entire people, and destroyed the German civilization so high before.

By these conditions was architecture most strongly affected. Among the turmoils of the unrestrained soldiers, drawn from nearly every country in Europe, alternations of war and the uncertainties of all conditions, great architectural ideas could not develop, and if they did appear, were not executed without the greatest difficulties. In almost all lands visited or threatened by the war, architectural activity entirely ceased, indeed for some decades. Consequently the training of the masters and their workmen and also the traditions were lost, thus the basal requirements for a continuous progress in architecture. The creative arts lay fallow. When after the termination of the war they again commenced to recover, the basis for the development of architecture and intellectual and artistic opinions were different from before. The citizen class were weakened to the extreme by the burdens of the war, and was in no condition to give orders for great buildings. These could only come from the princes, the great and the often richly endowed ecclesiastical organizations. The former in the age of the absolute power of the princes

and of the privileges of the nobility first had the necessity for placing impressively before the eyes of the people their own power and eminence by grand and representative residences.

23 The ecclesiastical communities pursued similar aims, so far as they moved in the circle of ideas of Catholicism and the counterreformation, if these were also chiefly directed to the external personification of the faith and the most possibly impressive treatment of the Houses of God and of the divine service. In both cases men desired to affect the masses by new architectural impressions inspiring reverence, and thus the Barocco ideas coming from Italy were received with particular interest. It was unavoidable under existing conditions, that the planning, supervision and execution of the larger architectural designs, and particularly those for chateaus, churches and monasteries, could only be entrusted to Italians or to masters trained in Italy. These came in great numbers across the Alps, either at the call of secular or ecclesiastical builders or on their own account, seeking employment. Their richest field of work, they naturally found in the provinces remaining entirely or chiefly Catholic. They transplanted into these their style developed in Italy.

The people and the ornament loving host of little masters, who pleased themselves in the construction of splendid gateways, rich bay windows, fanciful gables and pretty fountains, were astonished by the foreign art, but without understanding it. Its grand conceptions directed toward a monumental effect of the masses found no ground in the petty nature of the people with its intellectual narrowness. This art was from the beginning onward purely courtly and hierarchical, in the last respect being principally Catholic.

Protestantism held itself entirely aloof from it. For north and middle Germany dominated by it, the impulses came from the Netherlands. Holland was then a flourishing and rich state by the concentration of European commerce in its cities, which under the free government of William of Orange attained high fame. Its schools were highly esteemed centres of learned culture; its engineers enjoyed the fame of excellent canal, fortification and city architects.

Holland had willingly afforded admission and protection to Protestantism. It offered to the Huguenots fleeing from France in consequence of the severe measures of Louis XIV a secure refuge and home, as soon as they passed the frontier of Holland. But in the broad stream of French emigrants Germany shared to a very important extent, partly through Holland. * In the states where princes and people favored Protestantism, thus principally in north Germany, the immigrants were favorably received. They were mostly active men, zealous for the faith, firmly adhering to their convictions and from the well to do class of French citizens, who turned their backs on the despotism of Louis XIV and took up their abode in a foreign land. They brought to this their culture and their art.

** After the revocation of the edict of Nantes (1685), many thousand families adhering to the Huguenot faith left the soil of France and settled in Holland, Germany and England.*

The Huguenots had previously devoted particular attention to architecture. They cherished that classicism developed in France, which was perfected by Francois Mansart (page 65). This tendency in art corresponded in its entire meaning to Protestantism. The contrast to the showy style of architecture fostered by the Jesuits and Catholicism led still to a further clarification in the sense of a severe conception, as free as possible from ornamental accessories. Then in Germany in the architecture commencing after the thirty years' war, there originated two great principal opposing tendencies; the Barocco of the South based on the Jesuit style and Italianism, and the classicism of the North adhering to the Netherlandish-French art. As in south Germany the Italians, so in north Germany the Netherlanders were preferred as designing and executing masters for the greater architectural undertakings.

But the architecture of Germany did not remain exclusively and permanently dependent on foreign architects. Besides the art endeavors brought into the country by them, the art cultivated by native masters also commenced an existence at first diffident and modest, but then so much the more strongly prominent. The German people again maintained itself and gave expressive evidence of its innate powers, in that after such

severe misfortunes as it had received by the unhappy war, it rapidly rose again to prosperity. The first motions of this art proceeded quite early after the ending of the war from regions, that had been spared by it. Their appearance stands in close connection with the national improvement, which the German states gradually won under the lead of Austria. Austria had not only continued as a strong power protecting Catholicism; it had defeated the greatly feared Turks before Vienna, and even been victorious over Louis XIV; it was then governed by its monarch Leopold I (1658-1705) in a just and very dignified way in consideration of the inefficiency of the princes at that time. After the Swedes were expelled by the great electors, even in middle and northern Germany the political conditions again became better. German consciousness arose. National inspired writers took the field against foreigners. Native masters soon successfully competed with foreign architects, and they increasingly succeeded in supplanting them, owing to their splendid endowments in art chiefly tending to decoration, and their better acquaintance with native conditions and mode of building. The interiors of Austria and Bohemia, particularly the royal palaces at Vienna and Prague, again became centres of German art, which celebrated great triumphs in chateau, church and monastery architecture. There was established worthily beside this in southwest Germany, in Bavaria, Franconia and also partly in the Rhine provinces an extensive art under the lead of native masters. Likewise in Saxony native architects acquired supremacy at that time, and similarly in Prussia, there indeed with changing fortunes.

The German Barocco art could only maintain its supremacy in church and monastery buildings during the entire epoch. In chateau architecture the inclination of the princes to surround themselves with the magnificence of the court of Louis XIV became fatal to it. Not merely the crowned heads of the great states but also the rulers of the numerous little principalities desired to have their "Versailles". Even before the first quarter of the 18th century, at the courts of Munich, Stuttgart, Karlsruhe, and later in the Palatinate and in

north Germany, particularly in Berlin, for most great undertakings were preferred French architects or those trained in France. Austria adhered very much longer to its Barocco, but in the end could not avoid the French influence. Thus the German Barocco style, which especially in Bavaria had so flourished, was suppressed by art forms streaming in from France, before it had been entirely developed and lived out its life. Indeed this French art -- the Rococo -- bore within itself the germ of its own destruction, when it brought strongly emphasized classicistic ideas from the predominating school of B Blondel (page 69), who prepared the soil for the new classicism and aided in its victory.

II. Historical Development and Style.

For the historical development of German architecture in the period of the Barocco and Rococo style, with the diversity of the impelling forces in time and place, general limits can only be given in very great outlines and with the reservation of many exceptions. We shall have to take into consideration the two great principal tendencies concerned, the Italian Barocco in the south and in the north the Dutch-French classicism, and so far as necessary the separate currents within these.

In south Germany the Barocco style commenced under the lead of the Jesuits about 1620 in Austria, Bohemia and Bavaria, and also in the Rhine provinces in certain monuments. (Jesuit churches). The war brought their activity in architecture to a close, particularly in its second half. The later and ever scarcer becoming monuments of the Jesuits extend down to about 1770, and they exhibit almost throughout a firm adherence to the teachings of Vignola in a dry and tasteless, rather scholastic conception.

About from 1650 onward Italian masters, independent of the Jesuits, began their epoch-making activity. Already since the penetration of the Renaissance, whole troops of well skilled workmen wandered from Italy into Germany, especially numerous after the close of the thirty years' war. They found at first a rich opportunity for work in the adjacent Austrian provinces. The religious contests were already decided there

indeed in favor of Catholicism. Under the protection of the absolute rulers of the country, this made a mighty advance. Then commenced an extremely rich ecclesiastical life, that again matured in willing sacrifices for the architectural needs of the churches and monasteries, that were not inferior to those of the middle ages. Catholicism acquired new power, i increasing strength and also an elevated external consequence. In contrast to Protestantism, inclined to internal divisions in questions of faith and to the formation of sects, it formed in itself a compact unity, that was carefully watched by the Jesuits, and if necessary, was protected by sharp spiritual weapons. By their wide views, their political sense and the force of conviction, with which they represented their opinions of the world, they won extended circles of the German nobility, of the learned world, statesmen, and particularly also artists as spiritual adherents to their ranks. In an unexpected way flourished ecclesiastical activity in architecture and art again, and which had been so much repressed in the period of the Renaissance. It also offered attractive commissions to Italian artists of fame.

The chief points of support of the Italians were Graz, Salzburg and Munich. From thence they spread over the remainder of Austria, into Bohemia, Bavaria, Swabia, Baden, Franconia and also in part into middle Germany, Saxony and Silesia. They created there an astonishing number of churches and monasteries meriting consideration and frequently great, as well as of chateaus. Their activity fills the entire second half of the 17th century and even extends in the southwest and middle Germany into the first quarter of the 18th century, and beyond this in certain cases. Their climax was attained in Austria and in Bavaria indeed in the time from about 1670 to 1700.

German masters, who impressed on their works the stamp of a national conception of the Barocco style already appeared about 1655 in the Fichtel mountains (Waldsassen), also two decades later in Switzerland (Einsiedeln) and in southwest Germany with creations important in the history of art. Their most fruitful field of work they found in Austria, Bohemia,

Bavaria, Saxony and Franconia. Their climax in general falls in the first three decades of the 18th century, but maintained itself in the interior of Austria, particularly in the imperial city of Vienna, extremely rich in animated activity in art, and in Franconia until about the middle of the century. ¹²⁷ Later this Barocco art lost ever more, until about 1760 -- aside from the somewhat longer continuing Barocco architecture -- it almost completely yielded to the French art penetrating from the west.

In north Germany the Dutch classicism commenced its course of development directly after the termination of the thirty years' war. Already about 1650 Dutch architects were called to Berlin by the Great Elector with the commission to carry out the fortification of the city, a new plan of the streets, and to enlarge or establish palace buildings. Their number increased and was strengthened, particularly by the immigrant Huguenots, whose extension considerably increased, and thereby their influence on Protestant church architecture and secular architecture. On foreign soil the Huguenots adhered with great tenacity to their architectural style. This may be followed on a series of monuments until the middle of the 18th century.

Native masters of fame arose in Protestantism, aside from some artistically less important predecessors appearing after the end of the war, first in the last quarter of the 17th century, at a time when pietism permeated more deeply the Protestant spiritual life. A determining influence was exerted by some theorists, who appeared for a strict adherence to the course of the Dutch-French classicism based on the instructions of Vitruvius. This predominating philosophical-literary conception of art corresponded very particularly to Protestantism, not only as a contrast to that of Catholicism, that on its part gave wide playroom to the good pleasure in the Barocco wealth of forms directly influencing the popular mind, but also in regard to its entire meaning, its tasteless and coldly judging intelligence. It is in no wise more national than the south German Barocco; for it makes far less of the enjoyment peculiar to the German nation in the accenting

of certain parts, in rich alternation of forms, charming treatment of details and luxuriant decoration, than does the Catholic Barocco of the South. *

** Therefore it is not surprising, if in the territory of the margrave of Ansbach-Brandenburg, Italian masters obtained preference for building châteaux.*

Until toward the end of the 17th century in the Protestant portions of middle and north Germany, particularly in Bremen, Bamberg, Cassell, Hesse-Nassau and the Palatinate, the style of the architecture was principally Dutch-Classistic. But in the 18th century these architectural domains also became the scene of freer endeavors in art. Classicism indeed retained supremacy; but some powerful artistic natures were inclined toward the Barocco abundance of forms, and animated it by a treatment and sculpture borrowed from the Barocco. A decided importance was secured by the ever more strongly advancing French world of form. Already about the middle of the 17th century had the French conception of art found entrance at the court of Berlin (François Blondel, page 69, during the fifties was in the diplomatic service at the French embassy in Berlin and also busied himself there in art); after 1720 it stands in the foreground of architectural creation. As in Bavaria, so also in the north men thenceforth preferred French masters or natives trained in France. Indeed in the north the Barocco fire experienced a stronger quenching by classicism than in the south.

About the middle of the 18th century the contest of the masters fostering classicism against the Barocco and the Rococo became more pointed and stubborn. About 1760 its victory was decided along the entire line, in the north as in the south, even if the decorative style of the Rococo was able to predominate still in interiors and in art industries for a decade (until about 1770). But in the interior of Austria the Barocco keynote still appeared in the buildings for a long time, and in Hungary it maintained itself until in the 19th century, though indeed considerably weakened.

The development of the style proceeds from the architectural style introduced by the foreign architects, in the south

from the Italian and in the north from the Dutch architecture. Yet these masters could not preserve permanently in these lands foreign to them their art forms in style in their original purity. Separated from their people, they adopted new materials on the new soil, so that their creations acquired in increasing measure a changed character, corresponding to Germany. The process was completed the more rapidly, the less they allowed themselves to be guided by purely academic considerations, and the the more they permitted free scope to free art in design. Since the directly preceding Italian and Dutch architecture has already been described, we shall only have to consider in the following those changes and innovations, which may be taken as characteristic of German art.

CATHOLIC CHURCH ARCHITECTURE is directly connected with the models afforded by the Jesuit churches (Fig. 105 b; volume 2, Fig. 267). The Jestsuits themselves had frequently altered the scheme for the ground plans of churches given by the church Gesu in Rome, and they had in part developed it further. * If the area of the site or the cost must be economized, the transepts were omitted. The choir then formed a direct continuation of the middle aisle. Also the chapels of the nave were sometimes limited in depth. The construction of two stately facade towers with a careful adjustment of their proportions to the dome became the rule after the beginning of the 17th century. Between them opened a vestibule, over which was found the organ gallery in the interior. for the subdivision of the internal piers (Fig. 107) were preferably chosen Corinthian pilasters. Galleries over the chapels were unwillingly omitted. On the main cornice extending around were directly set the tunnel vaults; above the crossing by the mediation of pendentives was placed the drum of the dome. The architectural treatment approached that of the Roman high Renaissance. But the members otherwise allowed a pure academic treatment to appear. Stucco ornaments were employed in rich measure. In them the acanthus scroll predominated in a heavy and flat form. but it was connected with branches and twigs of plants, which were modeled as naturally as casts after nature. White prevails as the color (indeed with reference to the Roman marble) in combination with gold.

* It should be particularly stated here, that where the Jesuits found a powerful national art, they made thorough concessions to it (volume 2, page 280). But in Germany, where architectural traditions were destroyed by the 30 years' war, and where they must place special emphasis on affecting the masses by new and grand buildings, and also express artistically the unity and solidarity of Catholicism, they returned again to the original form of the Roman Barocco church of the order, the church Gesu in Rome.

By the masters independent of the Jesuits the ground plans of churches scarcely experienced any apparent change. They were frequently restricted by existing conditions, so that a certain diversity appeared. Likewise the structure adhered to the models developed in their country and given by the Jesuits. The principal charm of their buildings lies in the extreme masterly and sketchy treatment of the stucco and in the abundance of forms, which attract the eye by novel and surprising thoughts, and motives in small figures and in ornament. (Fig. 109). In this as in the entire treatment of the details an influence of the German spirit shows itself. The architectural members exhibit a force, surpassing what was previously thought permissible in Italy. (Compare Figs. 7 and 107). The greater freedom in the forms afforded room for a luxuriant enjoyment in the treatment. Likewise on the facades the Italian masters indulged in curvatures, such as only occur in Italy as exceptional cases. (Fig. 108). Thus the works created by Italians on this side of the Alps received a different stamp. The influences received again reacted on the architecture of their southern native land. *

* The architecture of towers in Rome was developed by masters from upper Italy; in Milan and in other cities of upper Italy stand a large number of palaces from the 18th century, which in regard to their architecture fall entirely outside the bounds of the other contemporary art of Italy, and stand apparently in direct connection with preceding works of the Barocco style of Vienna and of Munich.

In the German provinces the Italians had undertaken surprising things in churches, particularly as stucco-workers and

painters. The confidence in them by their employers was so great, as the most striking manifestation of the wonderful art of the Roman Catholic spirit, and also so unscrupulous, -- that after the example given by Borromini -- they furnished important mediaeval churches with Barocco decorations, particularly those in Romanesque. (Fig. 109). Thereby they very greatly injured their work in the eyes of discreet and critically qualified contemporaries, and especially in the judgement of the later world. For the architectural forms introduced by them were designed for wide, unified and well lighted internal creations; in the narrow and dark Romanesque buildings subdivided by massive detached piers, they seemed foreign, heavy and oppressive, even if they also presented many beauties in details. Aside from some great masters, the Italians were rather technical amateurs and decorators, than creators of interiors freely from the architectural programme.

The German Barocco masters were independently opposed to the scheme developed in the Jesuit churches. but they indeed also started from that, though soon showing a preference for adhering to the form of the Latin cross, to the accenting of the longitudinal axis, and likewise that of the transverse aisle by extending this by apses, or by development into an oval domed interior. Finally they progressed to the resolution of the central space and also frequently of the transepts into oval or circular domed areas, which by their magnitude, sequence and treatment produce the highest enhancement of the impression of the interior. (Figs. 110, 146, 150, 152, 167, 168). Where men decided for central designs, they likewise sought for them new and peculiar solutions. (Figs. 132, 150).

In the requirements for height and spaciousness of churches the German masters even surpassed the Italians. In order to connect the internal effect of the chapels more than before with that of the principal middle interior, it was further limited in depth and was made high, which is particularly characteristic for the German Barocco, not seldom to the imposts of the main vault. The principal cornice, which in the church Gesu extends just above the arches, is then broken around the walls of the chapels (Fürstenfeld, Weingarten), and sometimes it rose above the round arches and followed them,

so that an uncommonly animated wall architecture originated. (Monastery church at Einsiedeln). Like wise with the tunnel vault usual in Italy men were not contented; they rather preferred instead the higher appearing cross vault, indeed also if it were subdivided by transverse arches into separate bays.

The German masters devoted particular attention to the treatment of the forms. Corresponding to their requirements, they showed themselves particularly accessible to architectural and decorative novelties. These aroused their interest so much the more, the more striking they became. But the innovations in style did not come exclusively from Italy, but also from Belgium. Their introducer was chiefly the theorist J. von Sandrart (1606-1688), a native of Frankfurt, who had been engaged in art with great success in Antwerp and in Rome, and having returned to his native land, he made the elevation of German art in itself the problem of his life. He served this both with the influence of his highly respected position as well as by his writings. Against foreigners he took the field in speech and writings, both against those coming from Italy as well as those coming from Holland. His book on architecture was very much esteemed later, and besides a refined explanation of the orders, it contains chiefly doorway and window enclosures, that exhibit the peculiar riotous abundance of forms peculiar to the Belgian art of that time. (Page 106). The German masters readily adopted these, but also entirely passed over in the general architecture to more animated forms, than the Italian. Far more commonly than those, they give to the facades surfaces curved in and out (Fig. 111). The clustered columns and pilasters were employed with greater freedom and were purely picturesque with cornices broken in the extreme. A very fanciful treatment was received by the caps and the additions over the portals and windows, the crownings, and also especially the spires of the towers. (Fig. 112). In the interior the German architects proceeded with astonishing boldness in the selection of their means of expression. To enhance the perspective effect of the interior as much as possible (after 1700), the pilasters projecting from the piers were commonly set diagonally. The trans-

transverse arches rise from them in a curve to the apex of the vault and from this pass down to the corresponding pilaster of the opposite wall. (Fig. 109). The ceiling thereby received an animated Barocco subdivision. This oblique position of the pilasters is already found in the designs of Guarini (page 87). It was indeed a most advanced and venturesome novelty, by which the Turin masters, considered according to the Italian conception, had already passed the limits of the permissible. The German masters, who had previously had a particular enjoyment of technically interesting art ideas, took it up and developed it further, indeed in that the obliquely set pilaster was not employed in a purely decorative sense like the Italian, but as a new structural idea for heightening the effect of the interior and the richness of the perspective views. Likewise the condensed (sitting) columns and pilasters, that occur in one of Pozzo's designs (page 35), are not seldom found in Germany (Fig. 113). Thus just the boldest and most daring Italian architects found successors in a kindred spirit in the German masters.

New things were created by the German architects in ornamental art. In pilasters, panels of transverse arches, on piers and in the wall panels, they replaced the heavy and swelled Italian ornamental work by a band-like surface ornament, a view of which is given by Fig. 114. The gracefully intersecting bands extending in elegant curves with rich alternation with straight lines are organically connected with acanthus bells, leaves, rosettes and hanging leaves in an extremely charming way. Also where the stucco decorations still follow the Italian art style, the band-work plays about the cornices and the panels in elegant curves. (Fig. 115). The figures remaining between the different bands on the background were harmonized in delicate color tones. (Figs. 143, 152, 153). The development of this surface ornament from the northern Renaissance is not difficult to recognize. It differs from the ornament of Berian (page 72) with similar lines, in that the latter entirely forms grotesques (volume 2, page 192), while this concerns only a light and flowing play of lines. This German flat ornament occurs earliest on Dientzenhofer's

buildings at Prague and Bayreuth, and is indeed to be regarded as his creation. It was substantially derived from stucco methods. On works of internal church architecture executed in wood (altars, pulpits, organ cases and the like), the acanthus in bold scrolls and animated by figure ornament also long continued in use during the 18th century. (Fig. 116).

With the advance of the Rococo style from France, the Rococo ornament took its place. The new forms introduced by the French masters were adopted by the German artists with animated approval. With them these were not developed as in France, from a severe preceding classical school. They were rather directly taken over and indeed in the freest conception, only in use there later. The German decorators did not remain at this stage; they went further. Boffrand, the great master of the entirely mature French Rococo, had still firmly adhered to symmetry. The German artists also abandoned this and made dissymetry a principle, indeed not only within the separate wall panels as Meissonier did, but in the entire use. (Compare Figs. 69, 127, 164). The German Rococo ornament became broader, unrestrained and passionate, bolder and more naturalistic in the modeling. The panels lost themselves in terminations freely curved against each other. The acanthus leaf disappeared entirely in favor of the overgrown shell-work. An astonishing gift in design and artist's caprices was expressed in this. It finally often rejected every architectural basis required by the structural members or the panel work. (Fig. 118). This further development was based on the nature of the style. It was the German masters, who brought the Rococo to its climax. In regard to the directness of art creation, the enjoyment in treatment and the wealth of motives, they not only far excelled the French, but also the Italians. Therein they were not exclusively decorators; they rather had in their ranks not a few masters, who took into their service architecture, sculpture and painting in equal measure, and whose works were combined in full harmony into a unified whole.

MONASTERIES, ecclesiastical foundations and colleges as culture buildings of Catholicism took an active part in the changes of style, at first in the colleges of the Jesuits. For

their plans and treatment the Order had prescribed restrictions. College buildings must not compete with chateaus, but correspond to the modesty of the Order in regard to worldly possessions, but otherwise were to be constructed suitably for their purpose, free from objection hygienically and substantially. In general the Jesuits remained faithful to these basal principles. In most of the churches of their Order erected in Germany is not found that decorative overloading, those heavy and thoughtless swelled forms, of which one usually thinks in the conception of the "Jesuit" style. Besides them, the Benedictines, Cistercians, Premonstrants and the canons further appeared with creations of importance in the history of architecture. Aside from the church and the particularly accented main portal, in their monasteries some rooms received a richer treatment as a rule, which were to serve for assemblages, common use, or the reception of guests of high rank. Thus particularly the festal hall existing in nearly every important monastery, generally treated with important architectural means (Fig. 119), the library, the refectory, as well as the imperial chamber and that of the local ruler. The living cells of the monks remained almost entirely without any artistic ornamentation. For the formal treatment of the monastery buildings the circle of forms developed in Catholic church architecture was determinative.

PROTESTANT CHURCH ARCHITECTURE appeared after the termination of the thirty years' war still uncertain and groping for the solution of the architectural problems resulting from the peculiarity of its divine service. It was generally simply content with the churches abandoned to it by Catholicism. The altars were removed, the pulpit was placed at the middle of a side wall of the middle aisle, the altar being set before or beside it, and the seats were then faced toward these centres of divine service. Thus in this simple manner, and chiefly to emphasize the contrast with Catholicism, the longitudinal plan was transformed into the transverse plan. Further as regular parts of the Protestant church were introduced galleries along the sides opposite the pulpit, often in two stories above each other. Buildings erected for the purpose were

entirely simple, spacious hall churches covered by low vaults, mostly constructed of wood, that took into account artistic treatment but slightly.

Protestant church architecture reached a higher stage, when the theorist Leonhard Christian Sturm (born about 1669 in Altdorf near Nuremberg; died in 1729 at Blankenberg) secured a determining influence on the evolution of the northern architecture and furnished designs for Protestant churches. Sturm was a pupil of the Leyden teacher of architecture, Nicholas Goldmann (born at Breslau, died 1665), who followed the views of Villalpanda (volume 2, page 239) and published manuals on architecture, which in general were concerned with the theory of proportions of the columnar orders. From 1700 Sturm occupied a chair of mathematics at the university in Frankfurt-a-O, where architecture, as in the Roman colleges, was taught as a branch of mathematics. He represented the Vitruvian classicism as conceived by the French and the Dutch, held the orders to be the primary conception of all architectural beauty, but also required for his own time its own means of expression, and thus was an adherent of Perrault in spirit and opinions, whose Louvre facade represented to him the highest attainment of art. Sturm's endeavors were for producing a national art on the basis of the antique principles of beauty. He was a strong opponent of the Barocco and therefore, without so intending, prepared the ground for the entrance of French classicism. His importance in the history of art is based on the designs for Protestant church architecture published by him in the year 1712. (Fig. 120). He first fixed the requirements for the Protestant House of God:-- the creation of a room in which every one could see and hear the preacher well, thus a corresponding form of the ground plan, avoidance of columns, favorable arrangement of the pulpit, the altar, and of the organ for the church hymns, the construction of galleries over each other at the walls opposite the pulpit, with good lighting and simplicity in treatment. In regard to the shape of the ground plan, he opposed the cross form, since the internal space was injured by the reentrant angles, and the construction was made more expensive without necessity; he also advised against the use of all circular forms on

account of the difficult and more costly design of the arches and the roofs. On the contrary he held the square or rectangular hall church, the polygonal or even the triangular form as most suitable, and also recommended the arrangement shown by Schickhardt for the church in Freudenstadt, of two aisles at right angles to each other. (Volume 2, page 304). One sees from this how little attention Sturm paid to the structure and the effect of the whole as church architecture. He was a zealous Protestant and clearly expressed his faith in his designs; he was also an influential teacher and path-breaker for Protestant church architecture, but added this only by indeed very good ideas, though given from the dry standpoint of utility. The higher inspiration of a space-creating imagination was wanting to him. Yet Protestant church architecture thenceforth entered on an evolution conscious of its purpose.

Several types of ground plan were developed for it (Fig. 121):-- the hall church, and indeed as a longitudinal plan (A) with the greatest dimension in the main axis determined by the position of the altar, or as the transverse plan (B), in which the longitudinal direction of the hall lies at right angles to the principal axis. The former enjoyed particular favor, especially for small and medium city churches, since it greatly favored the organic connection of a tower with the nave and also thereby an impressive external treatment of the House of God. The extension of the interior by a choir or a choir apse was rejected as a rule; but men favored cutting off the angle obliquely at an end, where the altar found a place. The altar was sometimes moved nearer the middle and the galleries extended around, whereby the preacher had a less favorable position.

The transverse plan (B) Sturm had recommended as the best. It was employed in the Netherlands with especial frequency, and indeed from thence found entrance into Prussia, where it commonly occurred in the 18th century. It is there designated frequently as a "hall church" in a restricted sense, in contrast to the "longitudinal church" also usual in Catholicism. But on account of the position of the altar on the transverse axis of the room, it became less favorable for acous-

acoustics, the more the length of the hall exceeded its depth. For this reason its selection as the ground scheme of church buildings later greatly diminished.

If in a transverse plan the longitudinal wall opposite the altar and the pulpit -- the latter in this case stood directly behind the altar -- were opened and a wing were added there for the exterior and the form of the interior was made more favorable to the acoustics, this produced the T-shaped ground plan (C). This also resulted if from a cross-shaped church were omitted the arm regarded as a choir. Although this form is regarded as entirely suitable for Protestant church architecture, it was however seldom built.

The pure cross form (D), in spite of the fact that Sturm declared it unsuitable for Protestant church architecture, received the preference in numerous cases. For this was chiefly determinative the circumstance, that this made possible an impressive external appearance. But (in the 18 th century) men rejected the Latin in favor of the Greek cross with relatively short arms of equal or nearly equal length. In consequence of the differences in construction and the cost, the crossing but seldom and only on small churches was covered by a crossing tower or by a drum and dome.

The polygonal plan (E) presented the very precious advantage of gathering a numerous congregation of hearers in the most favorable manner around the pulpit. But especially in large buildings, it requires such a high expenditure in construction for the erection of a corresponding internal ceiling and external roof construction, and for the then necessary introduction of the required overhead lighting, that it was but exceptionally executed -- frequently under injurious restrictions.

For circular churches (F), either with circular or oval ground plans, this was the case in a still higher degree. Therefore like the polygonal buildings, they occur comparatively seldom and mostly with but small dimensions.

Aside from few exceptions, the structure has not created individual types. The organism well developed in Catholic church architecture comprising ground plan, treatment of walls and form of the ceiling is generally not to be found there.

The requirement of spaciousness and the avoidance of internal free supports but seldom permitted the construction of large vaults and domes. The omission of the choir caused the loss of the most favorite portion of the interior of the church. The arrangement of the entire treatment of the interior and the architecture with reference to it no longer had any reason. The importance of the high altars of the Catholic church could not be replaced by those of the altar and the pulpit in the Protestant church. By the usual position of the pulpit at the middle of the longitudinal wall was nearly excluded the enhancement of the architectural effect of its surroundings. To this was added, that the insertion of galleries, and particularly if these were arranged in several stories, very greatly reduced the grand effect of the interior. Men sought to avoid these disadvantages as much as possible, retained from one case to another entire freedom in the choice of architectural expedients, and avoided as far as possible all reminiscences of Catholic church architecture, already to remove any ground for comparison. On the whole the opinion prevailed, that for the Protestant church architecture and the simplicity of its divine service only a complete modesty in architectural and decorative expedients was suitable. In fact with the exception of the often very richly treated chateau churches and a number of monumentally erected principal churches, Protestant church architecture invariably remained faithful to the ground principle of great simplicity.

In the interior a severe treatment of the walls by pilasters and arches is comparatively rare. In interiors with several aisles, columns on account of their smaller dimensions are more commonly employed than piers. The galleries either rest on separate small supports, or they are attached to the internal columns or piers supporting the ceiling, sometimes intersecting them. * On them rests directly the entablature (architrave, frieze and cornice), or these rise from these arches of mostly depressed form, above which a crowning cornice extends as the upper termination of the wall. (Fig. 156). The ceilings are chiefly constructed of wood, indeed as horizontal ceilings, often with a large vault at the top of the

wall or in the form of a depressed tunnel, mirror, cross or domical vaults. These were plastered and sometimes had imitative cross arches and ribs. If domes were constructed in the interiors of central designs, these only appear externally by exception; men were then frequently satisfied with a roof turret, which introduced the necessary overhead light in the dome as a lantern.

** In order to be able to give the supports of the galleries as small a diameter as possible, iron columns were selected in Hamburg (Great S. Michael's church etc.), already about the middle of the 18th century. We have there one of the earliest examples of the introduction of iron into architecture.*

For longitudinal churches with one or two facade towers, the exterior in general differs but little from the Catholic churches. The central buildings also agree with those of the Catholics, particularly if they are erected on the Greek cross plan, but as a rule the transverse structures only when they received a correspondingly treated tower. In other cases they frequently resemble secular buildings, assembly halls and hall buildings; this impression was not much changed when a portico with four or more columns was added as a temple facade. Certain circular structures recall the Roman Pantheon, either intentionally or by the plan. (Fig. 122). The interior arranged in the circular or oval form in churches terminating in a rounded form, by concentric rows of seats rising behind each other and by the galleries placed over each other in several stories, has many traits agreeing with the parquet and the galleries of theatres. (Figs. 156, 157).

The development in form of the Protestant churches chiefly follows the art tendency prevailing in the different architectural provinces or preferred by the rulers. Thus in the east predominated as a model the Byzantine style derived from Catholic church architecture, and indeed in the chateau chapels in a comparatively rich form and in the community churches in a simplified treatment, but in the north on the contrary in the classicism fostered there, chiefly developed in secular architecture.

CHATEAU ARCHITECTURE required a longer time for it to attain a development in plan, architecture and internal decoration corresponding to the ground principles of the Barocco style. Not as in Catholic church architecture, for which on account of the complete uniformity of the religious worship on both sides of the Alps, the Italian style of architecture corresponded to the requirements without extensive changes, a model developed in a foreign country could not be adopted for it. Of the Italian palace architecture the arcaded court, which still generally occurred in the southern countries in the chateaus of the later Renaissance, lost its importance, since the social and home life far more than formerly was spent in the salons and the more private living rooms. Also the rigid adherence of the Italian palace to the ground plan of an enclosed rectangle, to the unbroken architectural lines, animated by no projection, to the consistent facade system executed and repeated without change, that only expressed one idea in unified forms, could not satisfy the German art in design. The Italian masters entrusted with the erection of chateaus in Germany had to consider the changed needs, customs and requirements of their employers. Their works differed in plan and architecture from the Barocco palaces of Italy. The architectural masses were subdivided by projections and recessions, certain parts and especially the projections were particularly emphasized, and the portals and windows had an alternating treatment; the whole was more animated, also richer and more impressive in the architecture. Likewise the Huguenot-Dutch masters active in middle and north Germany, who from the first stood infinitely nearer Germany than the Italians, changed in many respects the architectural style developed in their native land or in Holland. On the contrary the native masters preferred to adhere to the preceding Renaissance, when they adopted foreign influences in increasing measure, and to work according to their own designs.

For the ground plans soon became determinative the French court customs prevailing at the courts of the princes as well as with the great nobility. Already about the end of the 17th century became generally usual the sequence of anteroom,

audience room, throne room and bedchamber in a suite. In the 18 th century the chateau ground plan attained more fixed standards. In the year 1711 the German master Paul Decker (born 1677 at Nuremberg, died 1713 at Bayreuth) published an ideal design for a chateau, * by which he strongly influenced the German architecture of that time. The plan consists of a middle building with two wings projecting at right angles and enclosing a court of honor. On the principal axis of the middle building lies next the court the great state stairway, behind this being the garden hall in the lower story, in the upper being the main hall. Starting from this a division wall extends lengthwise through both stories of the building. At both sides of it lie rooms of medium size, that terminate in the state bedchamber with alcove and bed. The wings have at the centre a great stairway occupying the entire depth, with a grotto hall in the ground story in the angle pavilions, over it being the dining hall with the adjoining playing room and the library, and in the second story being likewise a dining and a playing or conversation hall, that is also designated as a "promenade hall". The cellar contains the housekeeping rooms, an upper story having the rooms for the servants. On the whole the requirements of a rich princely court are well considered; but in regard to convenience of arrangement, particularly of the appropriate connection of the rooms with each other and the suitable addition of subordinate rooms for the servants, this design is not of the best. Leonhard Christopher Sturm also published somewhat later an ideal design for a chateau, in which the main form of Decker's plan was retained, in which he showed himself decidedly superior to Decker as a master in the arrangement of the ground plan for the sequence and utilization of the rooms -- he separated the festival rooms from the proper living rooms -- in their connection and the care of the stairways and the subordinate rooms. Sturm also placed the halls in a long series between the principal apartment lying on the axis and the palace chapel. The main stairway he kept in grand proportions; he enclosed it by an open colonnade, in order to make the construction effective. The perfection of the solution of the ground plan was a

attained in the second quarter of the 18 th century, after the French model for it had reached determining importance.

* *"Der Fürstliche Baumeister oder Architectura civilis". Augsburg. 1711-1718.*

So far as the buildings were erected by native masters, the architectural treatment and decoration were connected with the preceding cabinet-makers' architecture. The bent columns and pilasters used by them, the gristle ornament, the very distorted grotesques introduced to superfluity, the twisted columns, broken pediments and the decorative additions of all parts were often transferred in the proportions established for cabinet work, thus producing at larger size a dry and swelled effect. The eye for the entirety was lost. Therefore monumentality was lacking in the works of the less important masters. Where a powerful effect was devised, the means were mostly wanting; coarsening the forms, misunderstood Barocco innovations, which bear all the marks of a transitional stage. About the end of the century the forms became clearer. About that time the better chateau buildings mostly had the following architecture; ashlar in the lower story, over this being a flat pilaster order appearing as if attached, or even pilaster orders in all three stories, with columns sometimes projecting from the principal parts, usually double windows, uncertain treatment of the profiles, rich ornament of garlands of leaves and festoons of fruits in a dry treatment in relief. (Figs. 123, 124). The interior indicates the Barocco taste by the heaping and enlargement of the members, by the inclination to free transformations, the prominence of the relief figure decoration and the bold scrolled ear-like cartouches, and particularly by the luxuriant ornamental decoration by strongly projecting and fleshy modeled acanthus scrolls, festoons of flowers and fruits, fluttering bands, draperies and the like. After the change of the century was generally expressed with increasing sharpness the separation into a south German, approximating the Italian, and a north German Barocco style chiefly influenced by the Huguenot-Dutch art.

In south Germany was adopted the wealth of forms of the Italian Barocco style, and it was employed according to native

designs for facades and internal architecture. Instead of a subdivision by wall strips, common particularly in Austria after the thirty years' war, pilasters and columns appeared with wall piers diminished downward like hermes. The middle building was strongly emphasized as well as the portal. (Figs. 138, 142). The windows received original enclosures with interrupted jambs, in whose sections a wide ogee moulding became characteristic, and caps with animated curvatures. Also the straight profile of the cornice was preferably made heavy; in order to increase the effect of the shadows, deep undercutting by hollows was given to the cornice, especially between the principal members. (Fig. 125). The capitals were very freely developed and were enriched by festoons of fruits and hangings like drapery. (Fig. 138). Above the principal cornice extends a balustrade formed of balusters or perforated slabs as a support for vases, trophies and statues. (Fig. 162). The crowning cornice of the middle building rises into a pediment at first triangular, afterwards curved in animated outlines, on whose tympanum the crown with the princely arms represents the climax of artistic splendor. (Fig. 172). Almost still richer than the court facades was treated the garden facade. There were especially considered a grand perspective effect, that was generally attained by the long line of the building, only slightly broken. (Fig. 126). This architecture maintained itself entirely in the south German chateaus, even after the French art had obtained a determining influence. On the whole the native masters showed themselves as opposed to large undecorated surfaces. In handling the architectural masses, the clarity of the grouping and the impressive arrangement and the treatment of the details of the architectural and decorative expenditure, the more important among them are not inferior to the foreigners.

The interior decoration consists in luxuriant show. Great architectural expedients are found in the vestibules, the principal stairways and in the festal halls; otherwise the subdivision into panels was common, whose enclosures afforded opportunity for the luxuriant development of ornamental work. From about 1700 onward this matured into the surface decoration composed of interlaced bands, scrolls, rosettes, suspended

leaf clusters and acanthus terminations, that we have described on page 134. For these Decker gave in his "Fürstlichen Baumeister" an extravagant wealth of models. In its full maturity (Figs. 143, 152, 153) this ornament is of an indeed ensnaring grace and beauty; in regard to the imagination in design and the harmonious coloring, it can stand beside the best ever created in ornamental forms. After 1725 the influence of the style of the regency becomes perceptible (page 73), and about a decade later comes the Rococo, that often appears directly and abruptly. Then the interiors receive that showy decoration, that was first developed in the French chateaus. (Page 76). From the anteroom to the state hall the magnificence is increased. In the small private rooms the panel work predominates as the subdivision of the walls. (Fig. 163). In the ornamental work mingle exotic forms, particularly Chinese motives. There are found inlaid floors of foreign woods, charming stucco work, costly gobelins, and in the state sleeping chamber are lavish gold embroideries, aside from the expensive curtains, the swelling couches, shining chandeliers and the rarest nicknacks of every kind. In the great festal halls a powerfully treated order is combined with the most luxuriant panel ornamentation, that finally in impassioned movement swells wave-like over the attic architecture in the transition to the ceiling paintings. (Fig. 127). After 1750 the more important masters return to a quieter treatment of forms, to a refined Rococo or even to a clarified Barocco. Thenceforth, even if at first but indistinctly, the advance of classicistic ideas becomes perceptible.

In north Germany the chateau buildings of the Huguenots (page 111) provided the models. The sequence required in France by the court customs was also not rejected there. The architecture of the facades shows there, where the Huguenot individuality appears, in the ground story ashlars and round arches, sometimes also in the succeeding story, but otherwise and in the upper story are rectangular or segmental windows, that are often crowned by alternately horizontal and segmental caps. The windows have a slender form and finely moulded enclosures, which are modest like the other details and are correctly designed in the classical sense. Ornamental decoration

was very sparingly employed; only over the windows are found garlands and trophies or figure reliefs in the tympanum after the Dutch style. Majestic quiet and dignified simplicity pass for the highest requirement. (Fig. 128).

The native masters of north and middle Germany were in great part dependent on foreign influences, and indeed they stood between the Huguenot-Dutch and the Palladian-Italian art. Their works in part are filled with the Barocco spirit. The facades in general exhibit an easy scholastic correctness. But in the internal decoration the German masters retained a certain independence; they were less strong there, than on the exterior. Yet they did not introduce the strong contrast between the simple external and the showy internal architecture as the French intentionally arranged it. They did not take for this internal art the curly Rococo of the school of Meissonier, but sought to refine the native Barocco. To their preference for nature, for plants and flower scrolls, they gave great scope, particularly in ornamental work. In the second quarter of the 18th century the tendency proceeding from the French Academy of Architecture exercised a determining influence. The reaction from this expressed itself about the middle of the century in a stronger inclination toward English Palladianism. Finally a style was developed, that was almost entirely divested of the national individuality.

THE ARCHITECTURE OF THE CITIZEN CLASS in south and middle Germany already about the end of the 17th century was entirely dominated by the forms of the Barocco style, and likewise in north Germany this also conquered a wide domain. The people found particular pleasure in the luxuriant ornamental work; they resigned themselves to an unrestrained enjoyment of the decoration, even if it also for a long time adhered to the ground lines of the earlier buildings. (Fig. 129). The designs of the citizen's buildings gradually adopted many Barocco tendencies. The city halls acquired impressive vestibules, broad stairways and one or more splendidly stuccoed halls decorated by paintings. They were often treated exactly like palaces. In the houses these rooms likewise extend to the entrance hall, the stairway and the better chambers. The

ceilings indeed receive stucco work, that is chiefly limited to curved paneled divisions with single rosettes. So much the more attention was devoted to the joinery. How deeply the Barocco and the Rococo penetrated among the people may be seen, in that even in the most distant mountain villages, in the so-called "good room" of the better peasants' houses dating from that time, occur pronounced Rococo doors and wardrobes; not rarely even the window shutters were covered by Rococo carvings.

In the citizens' architecture of north Germany the Barocco spirit appears chiefly in the regard to the convenience of the ground plan and the abundant dimensions of the vestibules, stairways and more important rooms or halls. For city halls and exchanges, Sturm published well considered designs, which follow the ground ideas of the city halls at Amsterdam and at Augsburg. The architecture indeed keeps within the limits of the art tendency there common, chiefly dominated by Huguenot-Dutch influences, but allows it to be recognized, that on the public buildings, as also on the dwellings of the rich merchants and the well to do citizens, the ornamental work from the Barocco and the Rococo was not wittingly rejected. On the half timber structures prevailing in certain regions, although the structural framework firmly adhered for another generation to the old traditions of the mechanics, the enjoyment of Barocco decorative work frequently appearing in obtrusive abundance. (Fig. 129). Otherwise the citizens' houses of the north are limited to the emphasizing of the portals and the facade of the principal story by bolder enclosures of the windows and a more carefully developed principal cornice.

Among the numerous minor arts, which in the Barocco and Rococo epochs were taken into the service of architecture, the smith's art further merits particular mention. The richness in art caprices in the designing of state gateways, grilles and panels, the refined feeling for style with which the art smiths transferred the forms of architectural decoration to wrought iron, and the perfected technical skill with which they treated the hard material, as if it were as plastic as wax (Fig. 130), ensures to their works a permanent place of honor in the history of the minor arts.

151 III. Most Important Monuments.

The period of the Barocco and Rococo styles produced in German lands an astonishing abundance of monuments, so that we must restrict ourselves in the enumeration, and even in the individual descriptions, be satisfied with the most necessary references.

IN AUSTRIA, among the many Italian masters, who wandered from the southern slope of the Alps into the north and west, chiefly the Carlone from Milan, Galli Bibiena from Bologna (page 35) and Luragho from Jermo near Ancona appeared with important creations. A direct precursor was the already mentioned Santino Solari, the builder of the cathedral of Salzburg (completed 1634), one of the grandest internal creations of the art of the 17th century on German soil. (Volume 2, page 303). Among the Carlone is to be mentioned in the first place Carl Antonio (died 1708 at Passau). He was engaged in the rebuilding of the monastery at Kremsmünster in upper Austria. At his entrance into the service the conventual buildings (1605-1652) had already been erected by less important masters. On the contrary he clothed in Barocco forms the three aisled church, terminating in three apses and dating from the year 1298. (Fig. 109). More unified and on a plan with grand lines was built the monastery of Garsten near Steyr (1677-1693) by Giovanni Battista Carlone, an architectural plan composed of four wings grouped around a wide court. The facades have a rusticated ground story, over this being an Ionic pilaster order extending through three stories. The interior was entirely changed by rebuilding it into a penitentiary. Only the great and unusually deep principal stairway with three landings, which leads from the middle projection on the main axis to the former great hall, is still well preserved. The church (1637) is based on the scheme of the Jesuit churches with galleries. In the entirely naturalistic wreaths of leaves and flowers, which enclose the windows and the paintings and also appear in the cross arches of the vaults and the panels of the pilasters, is expressed the influence of the northern conception of art; even instead of the consoles beneath the geison of the crowning cornice is inserted an entirely naturalistic wreath of leaves. At the still

larger foundation of S. Florian near Linze the before mentioned Carl Antonio Carlone (1686-1708) was engaged as architect. He erected (1686-1689) the church on the foundation of an old early Gothic structure, of which he retained the crypt, and whose stucco work was by his brother Bartolommeo. The church is of large dimensions, has a wide middle aisle, that is accompanied on each side by four small chapels of small depth, a crossing and organ choirs instead of transepts, with a polygonal choir. The total length is 260.2 ft. On projecting Composite half columns 59.7 ft. high rests a returned, richly treated cornice with a wreath of leaves under the geison as at Garsten. Between and attached to the piers are Ionic columns supporting the arches of the chapels; above them are found balconies and galleries, that likewise open into the middle aisle in round arches. Rich relief and painted ornamentation heightens the grand general impression.

The end of the 17th and the first half of the 18th century bring to the Austrian capital, the imperial city of Vienna under the rule of Leopold I, Joseph I and Charles VI a flourishing epoch in art. The Barocco style developed there combines in the happiest manner the monumental symmetry of the Italian Barocco architecture with graceful lightness and charm of French, and with the enjoyment in decoration of German art. The foundation master is Johann Bernhard Fischer von Erlach the Elder (born 1650 at Prague, died 1723 at Vienna), a highly gifted artist, who had trained himself in Italy by the buildings of Bernini and of Borromini. In his "Entwurf einer historischer Architektur" (sketch for a historical architecture), that appeared in 1725, may be recognized a certain independence toward the traditional laws of art and an inclination to foreign influences, which give his art style a peculiar charm. His early work is the Collegiate church at Salzburg (1696-1707), a plan in the form of a Greek cross, whose arms lying on the main axis are extended, with four oval corner rooms and the rounding of the choir ending, and the entrance end in segmental arcs. The architectural superstructure (Fig. 131) exhibits influences from upper Italy; in the treatment of the facade, that consists of a concave project-

projecting middle building subdivided by a colossal order and two slender towers, but the master retains the German individuality in the freedom of the profiling in curves and deep undercuttings. On the church of S. Peter erected at Vienna by him in 1702-1713 the central plan is more strongly emphasized. Its plan is substantially repeated in Fischer's principal work in churches, S. Carlo Borromeo in Vienna, built 1716-1737. (Fig. 132). Adjoining a spacious oval dome, whose greater diameter lies on the main axis, is an elongated choir, two short cross arms and a narrow nave, between them being small radially arranged oval chapels. Over the chapels are galleries. At right angles to the nave, which is treated rather as a vestibule, lies a long and narrow passage, which at the first glance recalls the narthex of the Byzantine churches, but here is without any organic connection with the interior of the church. The master thereby obtained a wide facade, that he treated in a peculiar way. (Fig. 133). Before the principal entrance he placed a hexastyle portico designed strictly after the antique scheme. He accented the angles by architectural parts, which are half towers and half pavilions, indeed appearing as decorative structures built over the passages arranged at each side. Perhaps these were to serve as driveways for the more important visitors to the church, who used carriages. Between the angle towers and the columnar portico he erected slender bell towers attached to the facade in the form of Trajan's Column in Rome; thus originated a rather wonderful composition, but which is well harmonized with the high drum of the dome and gives the structure an original and extremely picturesque charm. The architectural treatment of the forms, particularly in the interior, recalls that of the school of upper Italy in the late Renaissance and Barocco styles.

Of Fischer's activity in secular architecture are first to be mentioned his plans for palace Schönbrunn near Vienna, that by the command of the emperor Leopold II was to take the place of the Renaissance structure ruined by the Turks in 1683. Fischer utilized the sloping site for a grand arrangement of terraces and cascades, that extended before the palace

lying on the hill. This received a U-shaped plan with a court widening in front by two great stages, whose extreme front portion is flanked by stables, and that opposite the palace by the housekeeping buildings. The internal subdivision and treatment of the rooms and the external architecture were much altered by later masters (after 1744). Likewise for the rebuilding of the imperial palace Hofburg, Fischer furnished several plans, which were but partly executed. He built a new facade on the long palace of the imperial Chancellery on the side next the court of the Palace, which received an animated treatment by three projections with gateways and balconies. (fig. 134). The two low bottom stories he treated with rustication, and combined the two upper ones by a colossal order of Corinthian pilasters; the projection was increased in height by an attic with crowning statues. The Winter Riding school likewise belongs to the imperial Hofburg (1716) and comprises a great rectangular hall enclosed by a high platform with Corinthian portico and gallery, and covered by a horizontal paneled ceiling. Indeed with reference to the adjacent portions of the Hofburg, the facade is in four stories with rustication in the two lower and a division by wall strips in the two upper stories, the third one as the principal story exhibiting round arched windows with richly ornamented pediment caps. In the year 1703 Fischer commenced the palace of Prince Eugene, the present Ministry of Finance. Here his architectural conceptions inclining toward the architecture of upper Italy were expressed with particular clearness. The long and unbroken facade, treated with heavy portals, has two lower half stories covered by rustication, above being a colossal Ionic pilaster order extending through the principal and an upper half story. The interior merits especial consideration by the grand stairway design and the magnificence of the entire internal treatment. Likewise for palace Trautson, (now palace of the Hungarian Lancers), erected 1720-1730, Fischer selected rustication for the high lower story and a great Composite pilaster order combining one and a half stories. There the windows of the main story are crowned by extremely rich additions, particularly in the middle building.

This palace may pass as the creative building of that style tendency developed in Vienna running parallel to the French Regency style, and which is there termed the Prince Eugene style. For the Court Library in Vienna Fischer designed the ground plan. The execution (1723-1726) he did not survive. The exterior of the very beautiful internal creation, consisting of a domed hall and two wings, has a simple construction as a rusticated ground story and an Ionic order; the facade is interrupted by these projections but exhibits an intentional severity, which by the avoidance of all curved lines attracts attention in comparison with Fischer's other buildings. Evidently his otherwise little known son and successor in office, Joseph Emanuel Fischer von Erlach (1695-1742), who was already more strongly inclined to French influences, chiefly influenced the treatment of the facade.

The art style of the elder Fischer exhibits a free and almost easy creation designed for picturesque effect and in the architectural treatment a combination of the architectural tendency of upper Italy, clarified by an infusion of the French art spirit, with the forms and the joy in ornament of the German masters; these are expressed particularly in the rich ornamental sculpture scattered over the facades with a refined feeling for rhythm. The imposing treatment of portals by statues, atlantes and balconies, the strong accenting of the principal axis, the bold Barocco ornaments over doorways and windows, the preference for nerves, are characteristic of him and determinative for the Vienna school. (Fig. 134).

The second great master of the Vienna Barocco style is Johann Lucas von Hildebrandt (1666-1745). He was born as the son of German parents in Genoa, received his training in Italy, early entered the Austrian service, and particularly enjoyed the patronage of Prince Eugene. For him was erected his principal work, the palace Belvedere in Vienna (1693-1724). The ground plan forms an elongated rectangle with polygonal angle pavilions. The principal axis is accented by the vestibule on the court side and on the garden side by a middle building containing the great hall. Through the one story and extremely gracefully treated vestibule (Fig. 135), one

passes to the state stairway in three flights, behind which lies the garden hall. The stairway leads to the great marble hall extending through the main and upper stories, adjoining which at the right and left are the rooms for court use. The plan of the palace fulfils in full measure all requirements for suitability and comfort proposed by a princely court. The architecture permits the recognition of German art in design in the treatment of the architectural masses, in the emphasizing of certain portions of the structure by a separate roof and the sky line animated thereby, in the enjoyment of a rich alternation of architectural and ornamental expedients, and which also attained supremacy in the internal decoration, although its execution was supervised by a Frenchman. On the whole, Hildebrandt shows more inclination toward ornamental and graceful than to heavy forms, to refined but a freer treatment of the cornices, a great preference for slender hermes in the most varied forms, and for repeated interruption of lines in the roofs. Around the shafts of the pilasters he liked to place a broad and usually decorated band (at about one-third their height). (Fig. 135). Hildebrandt is also designated as the builder of palace Daun, now Kinsky (1709-1713), whose facade has seven axes in width and shows a colossal composite pilaster order above the rusticated ground story, combining two stories, and which has a magnificently treated interior (Fig. 136), as well as of chateau Mirabell near Salzburg, whose great main stairway and marble hall treated with hermes are particularly famous. (Fig. 137). We shall return again to his participation in the planning of the palace of the prince bishop at Würzburg. (Page 182).

In church architecture in the Austrian provinces chiefly Jacob Prandauer (died 1726) of Pöltten beside the elder Fischer von Erlach. He was the creator of the magnificent monastery of Melk located on the Danube (begun 1702), a colossal design of high artistic importance. For the church arranged about in the middle of the inner clausure (volume 1, page 183), he assumed in general the ground plan of the church Gesu in Rome, but which he made three aisled by connecting the side chapels, elongating the principal axis to produce a deeper

perspective effect. At the already mentioned Foundation S. Florian (page 152), Prandauer assumed charge after Carlone's death (1708). The magnificent gateway represented in Fig. 138 strikingly illustrates his art style. Characteristic for it is the very free treatment of the members of the cornice. (Fig. 125). By deep undercuttings and the preference of curved profiles, he sought to give to the cornice that life and bold effect of shadows, which were attained beyond the Alps in the clear light of the South and with the material there employed, which was also reached by much simpler and more severe design. Also the foundation church at Dürnstein (Fig. begun 1718 by him and completed 1733, testifies to his great gifts for the creation of monumental interiors, richly inventive and cheerful splendor. Prandauer was a powerful and independent artistic nature, worthy to be counted in the series of the chief masters of German Barocco art.

The pupils and successors of the great architects mentioned in general continued in the tendency laid out by them. Some painters also produced very prominent works in internal architecture. Thus Daniel Gran originated a treatment in the Court Library in Vienna, whose facades are very inferior, but whose freshness and wealth of invention merit particular consideration. (Fig. 140).

In the Tyrol country among the numerous architectural works of the Barocco period stands in the foreground the church of S. Jacob in Innsbruck (1717-1724), which was built by the native master Anton Gump (1670-1730), with the aid of the Italian Claudius Belevio. The interior is in one aisle divided into four bays, but for the first two bays is extended by shallow chapels and at the third by semicircular apses like transepts. The three first bays are covered by transversely placed low oval domes, the last one over the square choir having a round chapel. Here as at the government palace at Innsbruck (Fig. 141), also built by Anton Gump in 1719-1728), the master exhibits his power of treatment devoted to great expedients. In striking contrast to Gump's architectural style is the Catholic Casino there, a show piece of the gayest stucco decorations, which extend over the facade in lavish abundance.

Of the Barocco buildings in Steiermark we have to mention the church of Mariahilf in Graz, kept within heavy Italian Barocco forms, for which Joseph Hueber built an elegant facade about 1744. (Fig. 103).

In Mähren the two Jesuit churches at Brünn (1602-1739) and at Olmütz (1692-1728), the former a basilican and the latter a normal plan with side chapels and galleries, are of the most prominent works on account of their splendid treatment.

The Bohemian capital, Prague, became the scene of rich architectural creation, where not only the clergy erected numerous churches, but also the feudal nobility built truly princely palaces in very great number, and where even the house of the wealthy citizen received a monumental treatment. (Fig. 142). There until the end of the 17th century Italian masters chiefly had the lead, and indeed besides the Jesuits, principally the artist families of Carlone and of Suragno (page 151). The Jesuits erected the great and richly treated Foundation of the Clementinum (begun 1653) and their Jesuit college in the New city. To the most important secular buildings of the Italians belongs palace Nostitz (1656-1660), built in the Kleinseite, whose powerful facade is subdivided by a Composite pilaster order standing on a rusticated base, as well as the grand palace Czernin on the Hradschin. This by the extremely monumental treatment of its facade produces a truly overpowering impression. The front is 472.5 ft. long and shows, above a lower story entirely covered by ashlar with panels, an unbroken series of heavy three quarter corinthian columns, that comprise three and a half stories. The direct transfer of the Italian columnar construction to northern soil is here especially pleasing.

The further development of Bohemian architecture was determined by the creations of German masters; these belonged to the artist family of Dientzenhofer, whose ancestor George the Elder was born in the year 1614 in Aibling in upper Bavaria, and whose sons, George the Younger (1643-1689), Johann Leonhard (died 1707), Christoph (1655-1722) and Johann (died 1726) exercised a very fertile activity, especially in the domain of Catholic church architecture. In Prague first appeared

Christoph Dientzenhofer with a very important work, the Jesuit church of S. Nicholas in the Kleinseite, begun 1673 and only completed in 1760. The ground plan starts from the scheme of the chief church of the Jesuits, the church Gesu, but places a portico with an oval chapel at each side before the nave composed of three bays with side chapels, and enlarges the great domed area in trefoil shape by three shallow apses. The great boldness of the plan and of the architecture, the frequent curvatures of the walls, the diagonal positions of the piers (page 133) and the entire treatment of the forms permits the recognition of an intellectual connection with Guarini, who furnished a design for a Prague church. After the master's death his son, Kilian Ignaz Dientzenhofer (1690-1752) undertook the further work on the building. This highly esteemed architect received his training with his father, and worked with Fischer von Erlach in Vienna from 1710 until his return to Prague (1722), but also later visited Italy, France and England. Among his church buildings in Prague, S. Mikolaus in the old city is the most important. It is a central plan with octagonal domed interior, oval chapels on the diagonals and short transepts, of which the two lying on the main axis are elongated, indeed in the choir by two bays and a semicircular apse, at the opposite end by a vestibule. The external impression is determined by a great portal, the dome and two low angle towers. The architecture here appears, as also on the facade of S. Mikolaus in the Kleinseite executed by him (Fig. 111), in very animated and indeed capricious forms. More quietly restrained are the two secular buildings of the master, palace Golz (now Kinsky) and palace Piccolomini (now Nostitz am Graben), which in plan and treatment of forms show a close relationship with the Vienna palaces of Fischer the Elder and of Hildebrandt. The Vienna instructor of our master, Fischer von Erlach, was likewise employed in Prague. He had built there palace Clam Gallas (1707-1712), whose facade was quite astonishing by the dignified pose and the two state gateways, where atlantes supported the balconies. We shall later meet again with the Dientzenhofers.

IN BAVARIA, the cathedral at Kempten (1657-1666) is the ea-

earliest great architectural church structure, worthy of consideration by the interesting combination of the nave system with the central plan; into which an octagonal enclosed central building recalling Dutch churches, which directly opens by one side into the middle aisle of the basilican nave. The independence of the northern master Michael Beer from Au near Bregenz from the scheme transmitted by the Italians is here particularly evident. About ten years later the cathedral at Passau was rebuilt anew by Carlo Luragho (1638-1697) on the foundation walls of the cathedral burned in 1660, and it was furnished with a facade having two towers, the interior after a collapse and another fire being restored by J. B. Carlone, and treated in a masterly way by a powerful architecture executed in stucco.

An important starting point of a peculiar German-Barocco became the far removed monastery of Waldsassen in the Fichtel mountains. There George Dientzenhofer the Younger erected in 1635-1639 a chapel dedicated to the Trinity, in which he held himself free from all traditions. He chose for the plan a central design indeed referring to the Trinity, composed of an equilateral triangle with sides 45.9 ft. long and having semicircular apses on each side, producing a trefoil shape. Around it extends an aisle 13.1 ft. wide. The architecture is still uncertain and inferior; the exterior almost makes the impression of a mosque by the enclosed architectural masses with half domes and the slender round towers over the projecting angles of the nucleus structure.

The principal works of Bavarian Barocco architecture (aside from the buildings in Franconia) originated in and near Munich. There in the year 1663 Agostino Barelli (died 1679), called from Bologna by the elector Ferdinand, commenced the erection of the Theatine church of S. Cajetan, which after him was continued by a master from Graubünden, Enrico Zuccali, (died 1724), and completed by Francois Cuvillies (1698-1737), who came from France and was employed in Munich after 1725. The ground plan (Fig. 105) in general follows the lines of the plan given by the church Gesu in Rome. The facade with two towers and executed in stucco by Zuccali, with the except-

exception of the middle portion, elegantly treated by Cuvillies. The heavy internal architecture is exclusively in broken white, and with the dry acanthus scrolls in relief, the luxuriant wreaths of leaves and the twisted columns at the altars, exerted a lasting influence on the south German Barocco. On the church of Dreifaltigkeit (Trinity), built 1711-1814 by G. A. Viscardi, containing a square interior with the corners cut off, with four short cross arms, vestibule and choir, the picturesque and truly Barocco facade merits consideration.

About the end of the 17th century also began the great activity of the Bavarian electors in the erection of chateaus. In the year 1701 Max Emanuel had the chateau of Neue Schloss placed on the same axis and opposite the little chateau of Lustheim, erected by him in 1682 near Schleissheim. The very extensive structure consists of an elongated main building of small depth and two widely separated pavilions, connected with it by low galleries. The total length amounts to 1082.7 ft., that of the main structure being 554.5 ft. The extremely simple building is furnished internally with stucco decorations by a German artist, Joseph Effner (died 1745), rich in thought and finely designed, exhibiting the German Barocco at its highest perfection, and belong to the most graceful and worthy examples of the entire period. (Fig. 143). In Nymphenburg Agostino Barelli in 1663 commenced an unimportant chateau for the electress, that was enlarged by Viscardi and Effner. In the extensive park originated later some small chateaus of high artistic value, the Pagodenburg in 1716, the Badenburg in 1718, both erected by Effner, and the Amalienburg built by Francois Cuvillies in 1734-1739 (Fig. 144), whose interior was completed by a master evidently trained in the school of Robert de Cottes (page 75) with the assistance of German artists, in an extremely elegant Rococo style. Cuvillies was also the creator of the "rich chamber" in the royal palace restored after a fire in 1729, and which with the Amalienburg reaches the climax of the early Rococo. In the Balcon theatre erected by the same architects in 1751-1753, this attains full maturity.

Among the private buildings of Munich is to be mentioned

palace Freysing by Effner about 1727, which in its architecture is nearly allied to the palaces in Vienna and Prague; it shows the perfection of the Munich style of Barocco at that time, when Guvillies introduced the French Rococo.

With the most interesting creations of the Munich Barocco, as well as for the Barocco generally, belongs the small church of S. John Nepomuk. This was built about the year 1733 by the members of a widely distributed and very celebrated artist family, the brothers Asam. They were sons of the church painter Hans George Asam (1649-1711) from Sulzobach in Bavaria. The elder, Cosmas Damian (1686-1739) was a painter and encher; the younger, Aegid Quirin (1696-1750) was chiefly employed as stucco-worker and sculptor, but also as architect and painter.

They were chiefly in the service of ecclesiastical employers and decorated numerous churches and monasteries with an abundance of forms and color, that in like manner drew upon the architecture as well as sculpture and painting to attain the desired effect. Their highest triumph was indeed celebrated in the monastery at Weltenburg on the Danube (1717-1721) and in the before mentioned church of S. John Nepomuk at Munich, (Fig. 145), where a truly capricious flood of forms was poured over a comparatively small interior. * On the other numerous Barocco churches of middle and southern Bavaria can be mentioned only the great monastery church at Fürstenfeld, built in 1718-1736 after the plans of the court architect Viscardi, whose spacious nave was decorated by the brothers Asam, and the still more important Benedictine church at Ottobeuren (1737-1766), whose architect we must regard as Johann Michael Fischner (died 1766), much employed in south Germany, an architect influenced by Viscardi, who according to the inscription on his tomb in the Frauen church at Munich, erected 32 churches and 23 monasteries. The ground plans and architecture of these churches in contrast to the other Bavarian churches of the time already exhibit a return to a more severe conception.

* The style of decoration in upper Bavaria acquired a determining importance for the development of Barocco and rococo decoration in nearly all southern Germany. Besides the very busy Asams were engaged at most important building sites stucco-

stucco-workers and architects, at first in subordinate and later in leading positions, who came from the famous school of stucco-workers at Wessobrunn in upper Bavaria, among which the families of Zimmermann, Schmutzer, Uebélher and Feichtmayr have become particularly known. Until about the year 1725, they held fast to the school forms developed on the basis of the late Italian Barocco, but then passed over to the Rococo, which they finally carried to the last extreme. We meet with Wessobrunn masters at the Abbeys of Wessobrunn, Ottobeuren, Ettal, Weissman, Weingarten, Zwiefalten, Neresheim, Amorbach etc., as well as under Eßner on the chateau at Schlossheim, under Cuvillies on the Amalienburg and in the rich apartments of the royal palace at Munich, under Neumann on the chateau at Burcksdal etc.

Predominating foreign influences appeared on the great chateau of the Margrave at Ansbach, and indeed on the new building in Italian of the Palladian tendency, erected by Gabriel de Gabriellis after 1710, on the rebuilding by the architectural director G. W. von Zocha (after 1723), the French-Classical. The interior was decorated by Diego Carlone with the aid of native masters in a very delicate early Rococo.

In SOUTHWEST GERMANY and the adjacent SWITZERLAND, church architecture was dominated by the masters from the Bregenz forest (Vorarlberg). After the end of the great war, from which they were spared in their native land of Vorarlberg, they went down into the valley to seek work as masons, stone-cutters and stucco-workers. They had not lost connection with the architecture practised before the war, and their innate art in design was not turned in a definite direction by learned studies in Italy and France. In their first unimportant and naive works, but soon executed with the assured hand of the artist, is manifested a primitive and rich power over form, particularly directed to the grand and dignified treatment of interiors to demand attention. They are chiefly the architects Thumb, Huen, Moosbrugger and Beer. Peculiar to their churches is a greater length of the longitudinal axis, the extension of the domed area arranged in the middle to a more strongly expressed transverse aisle terminating in apses,

the high side aisles and the piers supporting the vaults; thereby in comparison with the churches built after Italian models, the effect of the interior is quite importantly enhanced, not only in the depth, but also particularly in the height of the interior. (Figs. 148, 149).

By these Vorarlberg masters are the two most important Barocco churches of Switzerland, the Foundation churches at Einsiedeln and at S. Gall. The creator of the church at Einsiedeln was Caspar Moosbrugger (1646-1723). Local conditions restricted the master in the free development of the ground plan. He chose for the included Gnaden (mercy) chapel a great octagon occupying nearly the entire width of the church and with a middle pier to support the vaults, adjoining this being a three aisled nave. The rich internal decorations were executed by the brothers Asam. The Foundation church at S. Gall was commenced in 1756 by Peter Thumb from Constance, a son of the Vorarlberg Thumb, and it was substantially completed in 1769. The ground plan exhibits a domed area arranged at the middle of the axis and occupying almost the entire width of the three aisled nave, the side aisles being continued around it, as employed by the Belgian Faid'herbe on his church Notre Dame d'Hanswyck at Mechlin. (Fig. 98).

In Wurtemberg Franz Beer built the Premonstrant abbey at W Weissenau, in whose church (1717-1724) he fully applied the hall system peculiar to the Vorarlberg school. The ground plan is composed of a wide middle aisle and narrow side aisles, divided into five bays, in the second and fourth bays being extended in transverse aisles to heighten the internal effect toward the altar. The same master also prepared the design for the great monastery church in Weingarten (1715-1722). In it was to be produced a design, which should surpass all previous Barocco churches of south Germany. (Length 390.4 ft.). The master again chose the nave with wide middle and narrow side aisles, but extended these at both sides of the domed interior placed nearly at the middle, into a transverse aisle with semicircular apses, which he also repeated at the end of the middle aisle. (Fig. 110). The galleries over the side aisles recede toward the external walls to enhance the

effect of the interior of the middle aisle. The facade is flanked by two towers. On the internal treatment were employed men from Wessobrunn and Italians; the famous ceiling frescos were by C. D. Asame. A purely central building is the Pilgrimage church at Steinhausen, (Figs. 148, 149), indeed of modest dimensions but statistically very worthy of consideration, erected 1727-1733 by a Wessobrunn architect, Dominicus Zimmermann, on an oval ground plan with tall piers and splendid decorations increasing from below upwards. (The paintings were by the master's brother, Johann Zimmermann). To the greatest religious buildings of the 18th century also belongs the monastery church at Zwiefalten (1738-1765), a work of a south German church architect already known to us, Johann Michael Fischer (page 165). The ground plan shows a spacious vestibule, over which is the organ gallery, a wide middle aisle with four chapels on each side, a slightly projecting transverse aisle, with a middle domed area and a long choir, consisting of one and a half squares. An imposing columnar architecture subdivides the interior, more developed in height than in width, which is otherwise finished with extremely rich Rococo decoration.

Among the Wurtemberg Barocco churches, aside from the monastery churches at Schöntal and Neresheim to be considered later (page 165), are also to be reckoned further the monastery church at Wiblingen, built 1772-1781 by the Allgäu master, J. G. Specht, a bold work with an overpoweringly grand treatment of the interior, entirely differing from the previous types of plan. The ground plan (Fig. 150) is composed of three adjacent squares, the first of which lies behind the entrance and has an internal length of 77.4 ft. at the side, the middle one is 84.6 ft., and the last being 48.0 ft. and forming the choir. The front square is curved outward at the entrance side, the middle one is intended for the altar of Mercy (Gnaden) and is enlarged by two great segmental apses, so that the middle room appears as nearly a circle of 68.9 ft. diameter. The choir ends in a semicircular apse. Thus with all the mobility of the lines a unified and imposing internal view is created. The architecture itself already belongs to

the succeeding period of Classicism.

For the erection of chateaus foreign architects were chiefly called into the country. On the chateau at Ludwigsburg, begun by duke Eberhard Ludwig in 1704, Lieutenant Colonel Friedrich Nette (died 1714) at first erected the so-called Fürstenau (prince's building), a narrow but high and long structure of no artistic importance, before which was arranged a square court of honor between two narrow wings. After Nette's death the duke entrusted the completion to Donato Frisoni (b (born 1683 on Lake Como; died 1735), previously engaged in Prague, who at the command of the duke had studied in Paris. He added the later buildings to the wing already established by his predecessor, but recessed them by two small offsets, (after the model of Versailles, page 87), and erected opposite the Fürstenbau as a termination the new wing. Thus originated a very deep rectangular court 524.9 x 196.9 ft., narrowing toward the main building (as in Versailles), which was divided into two parts by a grille. The gateways arranged between the wings opened on picturesque views. But otherwise the architecture and the form of the ground plan is without importance artistically, and likewise the internal decoration. Only the chateau chapel, arranged as a small central structure, forms an exception, and which was splendidly decorated in color by Italians. Frisoni also prepared the plan for the city of Ludwigsburg founded by the duke in a thoroughly Dutch character. The chief work of the secular architecture of Wurtemberg is the new chateau (Neue Schloss) at Stuttgart, built under duke Carl Eugene. For this Leopold Ketti, (died 1751), a nephew of the Ludwigsburg court architect Frisoni, who like him had received his training in Paris and from 1726 was in the service of Wurtemberg, then from 1730 to 1744 in that of Ansbach, prepared a design in the year 1744, and after advice and competition plans were received from other architects of fame (page 184), this was accepted for execution. The plan consists of three wings grouped around a deep court of honor open in front, each of which has a middle projection and angle pavilions, the structure itself being in two stories, to which toward the court of honor on the main

building and the projections is added also a mezzanine story. Each story on the principal facade is subdivided by an order of pilasters set in pairs in a regular sequence. After the death of Betti the building was continued until 1768 by Pierre de la Guepiere, laced from France and evidently trained in the school of the younger Blondel. The external architecture is executed in noble and almost classical forms; the internal decoration dates from a later time. Guepiere was also the creator of the magnificent pleasure chateau of Solitude near Stuttgart (after 1763), whose masterfully solved ground plan comprises an oval middle hall, also indicated externally, with three larger and several small rooms, as well as the similarly arranged and charming chateau of Monrepos near Ludwigsburg (after 1764), whose exterior exhibits a charming grace. The architecture here as in Solitude already shows the transition to Classicism; in the interior of the little chateau of Monrepos (1804), it is entirely treated in the forms of the mature Classicism.

In Baden the chateau of the Margrave Carl Wilhelm at Karlsruhe forms the chief building of the period. As then customary for the planning of large chateaus, the owner requested several architects of fame (Betti in Stuttgart, Neumann in Würzburg, Pedetti in Eichstätt and de la Guepiere in Stuttgart) to furnish plans. But the execution followed in 1752-1756 by Albrecht Friedrich von Kessler (an officer, who by permission of the margrave had studied for two years in Paris), indeed after plans for the building furnished by him. Adjoining the principal building, in whose axis lies the vestibule and the main stairway, at an obtuse angle of 135° determined by the city plan were two wings, of which the northern contains the chateau church. A great rectangular garden hall terminating in semicircles at both sides lies between the main stairway and the so-called Lead tower (Bleiturm), a remnant of the hunting chateau built on the site in the year 1715. This tower forms the starting point of 32 streets or alleys radiating toward the points of the compass. On the southern side extends in a great semicircle the city of Karlsruhe founded by the margrave. The Dutch influence is here undeniable,

as it is also expressed in the chateau itself, particularly in its cold and reserved architecture (Fig. 151). Special interest in the history of art must be afforded by the chateau at Bruchsal built by Damian Hugo von Schönborn, prince bishop of Spire. Like most Barocco chateaus the plan consists of three wings at right angles to each other and enclosing a court of honor, the middle one of these containing on the axis the main stairway and the main hall, while in the one wing with chambers is arranged the chateau church and in the other the great music hall. But the principal stairway differs entirely from the usual design in being rectangular with three straight flights. It lies in a domed room nearly circular and arranged in the middle of the main building, which in the principal story is treated as a vestibule, and to which lead up the two branches of the stairs 9.8 ft. wide adjoining the wall of the dome. The excellently lighted and splendidly decorated domed interior makes an extremely overpowering impression upon the visitor ascending the stairway, which was indeed the purpose of the creator of the plan. Likewise the remaining treatment of the interior is extremely fortunate in regard to its arrangement, the gradation of the dimensions and the connection with the subordinate rooms. The entire interior of the chateau presents in its splendid internal decoration, chiefly executed by the stucco-worker from Wessobrunn, Joh. Mich. Feichtmeier, and of the two painters Johannes and Januarius Zick, also in the sense of the time concerned, expresses the conception of suitability and comfort. According to recent investigations * the basal plan was by Anselm Franz von Ritter zu Grünstein, a master chiefly employed in Mentz, but also engaged in Pommersfelden, Bamberg and Wetzlar. The building was commenced in 1720. From 1728 onward Baltasar Neumann (page 180) had charge, under whom nearly the entire main building was executed on the remaining foundations, including the stairway. The principal apartments received in 1750-1755 their completion in the most flourishing and extremely elegant Rococo in purely German designs. (Fig. 127). For the chateau at Mannheim, more prominent by its magnitude than by the arrangement of the ground plan and its tr-

treatment, which the elector Carl Philip of the Palatinate had planned in his newly founded capital in the year 1720 by the French architect Jean Clemens Broimont, previously architect of the archbishop of Spire; Daniel Marot had (page 111) designed the general plan. But this was evidently often altered by Broimont, and indeed not to its advantage. The ground plan has a U-shape with very long front wings (1968.5 ft). From 1740 to 1748 Alessio da Galli Bibiena (died 1748) had charge, then Nicolas de Pigage from Luneville (1721-1796), the building director of Carl Theodore. The most valuable rooms are the room of the electress and the library. Bibiena was originally only employed as theatre architect at the court of Carl Philip, but in 1740 rose to become the upper director of the elector of the Palatinate, and he was ennobled by the elector, also furnishing plans for the tower and the facade toward the parade place of the dignified Merchants' Hall erected in the heart of the city (after 1725); with his pupil F. W. Saballiat he built the Jesuit church (1738-1760). It is a spacious and nobly treated building on the scheme of the church Gesù in Rome with a gabled portico before it, that opens toward the street in three round arches. Consideration in the history of architecture is further due to the city plan of Mannheim, after the destruction in 1689 by the French at the command of Louis XIV, which the elector Johann Wilhelm caused to be undertaken in accordance with the dimensions of a plan (page 123) prepared by the Dutch fortification architect Menno von Coehorn (1641-1704). Starting from the chateau, the streets were straight and entirely equidistant at right angles, distributed like a chessboard. For this not merely purely practical considerations relating to the utmost possible facilitation of traffic and hygienic attention to aiding a current of air through the straight streets was determinative, but indeed also a certain material sense, which by these streets everywhere opened a view of the wide and flat landscape. The preference of the elector Palatine for nature was expressed in the design of the very famous chateau gardens in the neighboring Schwetzingen, the summer residence. It was begun in 1748 according to a plan of the court gardener Augu-

Aug. Petri of Zweibrücken, and after 1757 was carried further by Nicolas de Pigage. The latter had studied in Paris and had undertaken great journeys through France, Italy and England, whose experiences he could utilize here. The Schwetzingen chateau garden is the ideal of a Barocco garden in the grand style with broad alleys, water basins, cascades, statues, temples, ruins and foreign architectural works (among others an imitation of a mosque), indeed entirely on a geometrical basis (page 111). The older portion with the straight rows of trees was extended by an "English garden".

* *Das Bruchsaler Schloss. Heiäelberg. 1910. Fritz Hirsch. Ph. B.*

With the artistically most worthy monuments of the Barocco style on Baden soil is to be reckoned still the Pilgrimage church at Walldürn built in 1698-1709 under Lothar Franz von Schönborn, archbishop of Mentz and Bamberg (Figs. 152, 153, 116). With the use of older architectural parts, it was built after the plans of Leonhard Dientzenhofer as a single aisled church with deep side chapels, transverse aisle and choir. The internal treatment has something of the style of Prandauer in its proportions to the interior, and the members are well harmonized together, as well as the wood carvings in the entire south German character developed from the Italian Barocco. The stucco work exhibits a banded ornamentation, which recalls that of Jean Berain (page 72), but which is here richly permeated by acanthus motives, in an extraordinarily elegant lines and charming and peculiar mouldings, whose effect is further enhanced by the delicate color tones and rich gilding. It is counted among the finest and most excellent stucco decorations of the period.

MIDDLE GERMANY AND RHINE PROVINCES. In Saxony the early and yet undeveloped Barocco style is represented by the palace in the great garden at Dresden, erected in 1679-1693, probably by Johann George Starcke. The plan as a rectangular middle building, that encloses a single great hall, with two wings projecting on both longer sides and a double flight of steps between the latter, as well as the entire architecture, (Fig. 124), permits the recognition of a predominating influ-

influence of the Italian late Renaissance. An extraordinary advance was made by the architectural activity in the Saxon capital, after the elector Friedrich August the Strong of Saxony was elected king of Poland (1697). The ~~energetic~~ prince was very much inclined to a luxurious court life, and for the realization of his architectural ideas, he found in Matthäus Daniel Pöppelmann (1662-1736) an architect of quite unusual gifts. From 1707 he was engaged on palace Taschenberg, of which almost only the wide four story facade, subdivided by a middle projection with rich window decorations, remains in its original condition. Pöppelmann's most splendid creation is the great court of honor enclosed by showy buildings, which received the name of Zwinger from the piece of ground used for them. (1711-1722). This is the executed portion of that grand festal plan, in which August the Strong desired to have a place for holding games and festivities of all kinds. The Zwinger has a rectangular area measuring 347.8×350.0 ft., enlarged on both longer sides by smaller rectangles terminating in semicircles to a transverse axis of 669.3 ft. At the angles and on the axes are erected two story pavilions, that are again connected together by one story gallery structures. The architectural ground motive is formed by the arcade between pilasters and hermes with rich broken entablature and balustrade, taken from the Roman Barocco, the latter sometimes serving as a parapet for the terrace covering the galleries. The whole is a creation of the happiest proportions in ground plan and structure. It bears an ornamentation developed from an intimate combination of the architectural members with ornamental and figure relief, but holding itself entirely free from the Rococo, in an overflowing abundance of forms, but which is retained within fixed bounds by the strongly accented main lines of the architecture. (Fig. 154). Thus the Zwinger appears as a reflection of the powerful, strutting, spirited and pomp-loving princes, for whom this grandiose Barocco architectural work, as if surrounded by the existing odor of champagne,,supplied the desired background for its splendid and luxurious festivals.

Besides Pöppelmann an important church architect was emplo-

employed in Dresden, George Bähr from Fürstenwalde, the creator indeed of the most famous Protestant church on German soil, the Frauen church (1726-1743). The ground plan (Fig. 155) comprises a circular principal room surrounded by eight piers, that is extended on the axes by niches, three of which contain the entrances, the fourth and larger comprising the choir with an apse. On the diagonals lie stairways to the galleries arranged in seven tiers above each other. The internal plan shows the most favorable solution yet found for the problem of obtaining a ground form and internal treatment suited in every respect for the Protestant divine service. On the exterior the ground plan is enclosed by a square about 131.2 ft. on a side, with cut-off corners and projecting choir apse. The middle parts and the oblique corners are treated as projections; the former terminate in pediments, and the latter in small towers like finials. Behind them rises, starting with a great concave curve, the dome crowned by a lantern. (Fig. 155). Everything and even the dome and the remainder of the roof is constructed in red cut stone with an amazing certainty in construction. The general impression is very imposing by the simple, clear and somewhat dryly treated architecture and the animated outline. The Frauen church is an entirely independent phenomenon in art history with an expressed German-citizen-Protestant character. The Catholic court church erected near the palace in 1738-1751 had an Italian as its creator, Gaetano Chiaveri (1689-1770). It was built in an elongated rectangle, terminating at the end in a semicircle, around which extends a narrow aisle with galleries, and along each of the two longer sides is an outer aisle having twice the width of the former. The rich external architecture, particularly in the high tower built over the main entrance, recalls the art of Borromini. Bähr's school appears in the Annen church in Dresden built in 1765-1769 by his pupil Johann George Schmidt (1707-1774), a rectangular hall (75.5 × 108.8 ft.) with galleries extending around it in an oval form (Fig. 156), and is even more strongly expressed in the likewise Protestant Kreuz church at Dresden (1769-1792). For it the ground plan is developed from a square, which is extended on t

the longitudinal axis by a semicircle at each end and on the right and left by a narrow side aisle continued in a semicircle at the choir end. At both sides of the tower erected over the main entrance lie the stairs to the galleries. The external architecture was influenced by the French-Classistic tendency; the interior (Fig. 151 shows the earlier condition) was enclosed in 1900 in modern forms after the preceding fire.

Of Bähr's private buildings in Dresden may be mentioned the palace de Saxe and the British hotel, both erected about 1720 as important city residences for the nobility, in an energetic style, often dry in details.

Besides the art tendency laid out by Pöppelmann and Bähr, another made itself felt in secular architecture in Dresden, which took its rise from the French-Huguenot school, and was represented in Dresden after 1713 by Zacharias Longuelune (1669-1748), educated in Paris. He commenced in 1715 at the command of the count of Flemming the Dutch (Japanese) palace as an enclosed rectangular plan with four wings, the longer sides being accented by middle and angle pavilions. The architecture of the court was by Pöppelmann. From 1728 onward the palace had meantime been acquired by king Augustus and was considerably enlarged. In that year Jean de Bodt, likewise educated in Paris, came to Dresden from Berlin (page 195), where he had obtained great success with his buildings in the French-Dutch style. He there attached himself closely to Longuelune with the same tendency and undertook with him the enlargement of the Dutch palace. Architecture then received a strong classical element. On the main facade already appeared broad wall strips instead of pilasters, between which lie the windows with their parapets as recessed bands; only the middle building was treated with a columnar architecture and a pediment above this in the true French conception. The two masters mentioned also influenced Joh. Rud. Fösch, who became known as the instructor at the Nobles' Academy and by the publication of his two manuals on architecture, and who in his first work, chiefly presenting architectural details (windows, doorways, pilasters, columns, balconies and the like), showed himself a pupil of Pöppelmann, but in his second appearance

in 1722-1729 the endeavor is clearly apparent to maintain the severe tendency. The latter also enjoyed the favor of the court in increasing measure from the beginning of the second quarter of the 18th century. Consequently in Dresden the Rococo did not reach full development. The principal master of Dresden architecture in the Rococo period was Joh. Christ. Knöffel, born in Dresden in 1686 (died 1752). His most important work was the palace erected for the powerful count Brühl in 1738-1751 on the Brühl terrace, which exerted a determining influence on Dresden architecture. The well conceived ground plan and the dignified architecture, subdivided in carefully graduated proportions, with the sparse employment of ornamental accessories permitted the recognition of the school of Bont and Longueune, from which Knöffel came. The internal treatment was graceful and elegant, but in uniformity without power. The famous building of its time was torn down in 1900.

Among the Barocco buildings in the remainder of Saxony are still a greater number of stately and palatial houses at Leipzig to be mentioned, and the Parish church erected in Grossenhain in 1745-1748 by Joh. George Schmidt, in which he selected the T-shaped plan, on account of using the old enclosing walls. (Fig. 121 C).

In Silesia the monastery church at Grussau near Landshtut, built in 1728-1735 by an unknown master, is the principal work of the Barocco style. It has a cross-shaped plan, with five chapels at each side of the nave and galleries over them. The avoidance of the straight line in the ground plan and on the pompous facade, and the entire treatment of the forms indicate the decided influence of the school of K. J. Dientzenhofer.

In Franconia the period of the Barocco and Rococo style brought the climax of its advance in art. There the Barocco architectural spirit indeed restricted the rich artistic powers of the people. The leading masters were the two brothers Leonhard and Johann Dientzenhofer (page 160), the last of these attaining the greater importance, and after them the chief master of the French Rococo, the talented Balthasar Neumann. They had the good fortune to receive grand architectural com-

commissions from the prince bishops of the family of Schönborn, that distinguished and art-loving race, who fostered architecture with a passionate love of building scarcely existing then. Würzburg on the Main became the centre of Franconian art creation. In the 17th century the Italian Antonio Petrini (died 1701) was engaged there, the creator of the imposing Foundation-Haug church (1670-1691). This had the plan of the church Gesu in Rome, but with transepts projecting more, a facade with two towers and in general earnest and heavy architectural forms. (Fig. 107). The very imposing dome dominates the picturesque view of the city of Würzburg. Petrini also built there on the old substructure of the tower of the University church (volume 2, page 311) the beautiful new tower, on which pilaster architecture was employed in the happiest manner. (Fig. 158). In the year 1707 began the rebuilding of the Romanesque Neumünster church in the Barocco taste. It received a new internal treatment, a Barocco dome and an impressive facade executed by Valentino Pezzani (died 1719), (Fig. 108), on which the strong curvature of the surface was indeed calculated for a favorable effect in the formerly very narrow Kürschner court. Besides the Italians mentioned, the German master Joseph Greising was employed at Würzburg in the first quarter of the 18th century, who in the Rückermain building (1715-1722), the former official house of the Foundation of the Knights of S. Burkard (Fig. 123), returned to the forms of the early German Barocco usual at the beginning of the century. The church of S. Peter in Würzburg, dating from the middle ages, Greising rebuilt (1717-1720) in a spirited way; its decorative treatment recalls that of the church at Wallöhrn. (Page 173).

In the eastern and northern portions of Franconia the architectural activity of this time lay chiefly in the hands of the two Bientzenhofers. An exceptional position was alone occupied by the city of Erlangen, founded in 1686 by the Huguenots and characterized by their architectural style, as well as the capital of the margrave at Bayreuth, particularly favorable to the Huguenots, who gladly took Huguenots into his service, or Italians, if particular show was desired. At Bamberg was built the church of S. Martin in 1686-1693 for t

the Jesuit college, as a cross plan with dome and galleries. It is not proved but is probable, that the design for the entire plan was by George Dientzenhofer. The facade was picturesquely constructed with great architectural means but without towers, but it must be referred to an Italian, perhaps to Petrini. For the new bishop's palace erected in Bamberg in 1695-1704 Lothar Franz von Schönborn took Leonard Dientzenhofer into his service. The building is in general tasteless and only possesses importance by the heavy pomp of the main hall. In Ebrach the same master erected in 1687-1698 the monastery buildings, which were planned in colossal dimensions, as became the custom thenceforth. On the likewise colossal conventual structures of the monastery at Banz (1698-1704) was employed Johann Dientzenhofer. Likewise the ground plan and form treatment of the abbey church there (1710-1718) indicates the same master. It is a long structure consisting of a main room formed of two transverse ellipses and extended by two elliptical side chapels at each side, with a short vestibule between the two facade towers, projecting externally in segmental form, and an opposite long and rounded choir. (Fig. 159). The treatment of the interior exhibits a great and purely picturesque unity, that by the diagonally set pilasters with the horizontally curved transverse arches in the ceiling, and a favorable lighting produces an astonishing effect.

The master restricted himself to a much severer tendency on the cathedral at Fulda, already commenced in 1704 and completed in 1712. This is a three aisled basilican cross plan with a dome over the crossing and two towers on the facade. (Fig. 160). In the nave alternate narrow and wide bays. By the well weighed proportions of the interior, nobly designed in the sense of the Roman Barocco, and the very strongly ornamented pilaster and arched architecture, together with an extremely favorable lighting, the interior belongs to the best creations of the church interiors of the time. Likewise in secular architecture Joh. Dientzenhofer proved himself a chief master of the developed Barocco style. In Pommersfelden he built in 1711-1718 for Lothar Franz von Schönborn, archbishop of Mentz and Bamberg, chateau Weissenstein, which is to be c

counted with the most important chateaus of the century, not only with regard to magnitude, but also by the artistic value of the great state stairway with two flights and halls as well as the main hall, subdivided by an alternation of full columns and pilasters, together with the comfortable equipment of the living rooms. In Bayreuth the margraves erected a series of Barocco structures intended to show their dignity, among which the Theatre built in 1744-1748 by Carlo Bibiena from Bologna (page 35) merits special consideration. It has an audience room forming a stilted semicircle in plan, with three rows of boxes and a stage 98.4 ft. deep. The facade is treated in severe classical forms, but the very rich internal decoration is in a refined Italian Barocco, in which appear scarcely any motives of the architectural forms of the German and French Barocco prevailing at that time.

Meanwhile at Würzburg the architect of the prince bishop, Joh. Balthasar Neumann (born 1687 in Eger, died 1753 in Würzburg) attained to high artistic fame. When Joh. Philip Franz von Schönborn was consecrated prince bishop of Würzburg (1719), he then adopted the plan of building an imposing and truly princely palace. The planning and execution he entrusted to his captain of artillery and engineer Neumann, who had taken part in the campaign of Prince Eugene in Hungary, who at this opportunity became acquainted with the Vienna buildings, and who was known as a spirited leader and a highly gifted architect. Already in the following year (May 22, 1720) the corner stone was laid with great solemnity; in 1744 the rough construction was completed, and the internal decoration about 1775 (aside from the chambers rearranged in 1806-1820; page 279). The plan consists of a main building 544.9 ft. long with two side wings projecting in U-shape from this, which are grouped around two nearly square internal courts and leave open between them a deep court of honor. The wings have facades of 190.3 ft. and a depth of 301.6 ft. From the court of honor one passes into a spacious vestibule, behind which lies the garden hall as usual. Neumann had planned a grand state stairway at each side of the vestibule. On the advice of the Paris architect Boffrand (page 78), before whom he la-

laid his designs for the palace at the desire of his employer in the year 1733 (he had likewise shown them to Robert de Cotte, page 78), only the stairway at the left of the vestibule was constructed -- not to the advantage of the general design. This stairway is built free in three very wide flights and terminates in the upper hall, which surrounds the stairway with wide passages. It is covered by a low mirror vault, on which Tiepolo executed his famous paintings. From the stairway hall one continues on the axis at right angles to a court of honor to the adjoining great "white hall" (hall of guards), from this to the main hall projecting from the facade. (Fig. 161). On the right and left of this and along the garden front is arranged the series of great rooms for the court. The different rooms are carefully graduated in regard to tasteful changes in dimensions and heights. In the extreme angle of the right wing lies the Court church with the main entrance on the front. The facades on the long garden front and the outer sides of the wings, Neumann subdivided by middle pavilions and projections at the angles; the fronts of the wings and the side facades of the court of honor (Fig. 162) have only projections at the angles, which stand in well weighed proportions to the middle projection, that strongly accents the axis of the recessed main building. After Friedrich Carl von Schönborn, who had previously been in the Austrian service as imperial vice chancellor, had ascended the bishop's throne and had entered into the inheritance from his brother Joh. Phil. Franz (in the year 1729), he caused the examination of the Würzburg building plans by the Vienna architect Lucas von Hildebrandt (page 156), then highly esteemed. A comparison of the plans sent to Vienna by Neumann in 1730 with the plan prepared by Hildebrandt in 1731 for the principal story shows that Hildebrandt arranged on the outer sides of each wing facades a middle oval hall and also two windows beside it in a middle pavilion projecting in approximately a half ellipse, while Neumann had provided rectangular projections; Hildebrandt further desired to have a long gallery in the right corner of the garden facade, but which was never executed, as well as some unimportant changes in the distrib-

distribution of the rooms, without other important deviations from Neumann's plan. To Hildebrandt's influence are thus substantially to be referred the round projections on the transverse axis, advantageous for the general appearance. The elevation consists of a high ground story, the principal story and two mezzanine stories, one of which lies above the ground story and the other above the principal story. The architectural system on the main facades toward the court of honor and on the middle pavilion of the garden facade corresponds to the importance of the rooms lying behind this, is composed of Tuscan and Composite three quarter columns, which comprises one and a half stories, but elsewhere by the corresponding arrangements of pilasters. (Fig. 162); on the garden front these are limited to the angle projections. (Fig. 126). The entire external architecture exhibits a very dignified and noble treatment. The interior contains the most splendid and costly apartments, in which all changes of style may be found, from the developed Barocco to the Classicism of the 19th century. (Figs. 113, 163, 164). *

** Likewise in purely technical respects this building is highly interesting. The mirror vaults over the great halls and salons-- the vault over the stairway hall has the enormous span of 62.3 x 105.0 ft. -- are constructed of porous plaster casts 5.51 ins. thick with a careful strengthening by ribs cast in the same material, spaced about 4.92 ft. on centres, like the ridge, hip and jack rafters of a hip roof, with a breadth of 19.7 ins. and projecting 7.9 to 11.8 ins. above the back of the vault. The side thrust of the vault is almost entirely neutralized by an excellent statically executed and very simple system of trusses and by iron rods in the enclosing walls, indeed in the direction in which the thrust is exerted. Neumann applied to the roof beams a coating of plaster 1.58 ins. thick, to which it is chiefly due, that the great fire of the year 1896 in the roof framework could not extend downward.*

For the prince-bishop Carl Friedrich von Schönborn, Neumann also built the important summer palace of Werneck (Fig. 165), whose formerly splendid internal decoration was entirely cha-

changed in 1801-1814 by the grand duke Ferdinand. How highly Neumann was esteemed in his time may be judged from the numerous commissions, which came to him from other reigning secular and ecclesiastical princes. We have already mentioned his activity at the chateau of Bruchsal (page 171). For the palace at Carlsruhe he prepared plans and also for the palace at Stuttgart, which, if they had been erected, would have far exceeded in area (length over 656.8 ft., breadth nearly as much), the palace at Würzburg. * Also his plans for a palace in Schuetzingen and for a new imperial palace in Vienna were never executed.

** The execution of Neumann's plan for the palace in Stuttgart would have cost more than two million gulden (florins). But the means available for the building could not have exceeded 800,000 gulden. Therefore the realization of the grand project could not be considered.*

Scarcely inferior in artistic importance to the secular works of Neumann are his monastery and church buildings. In Ebrach and Banz the monastery buildings commenced by Dientzenhofer (page 179) were enlarged and **completed** by Neumann, as well as in Schöntal. In Oberzell the master began in 1744 the monastery building, distinguished by its dignified and rich treatment, and completed by his son Ignaz in 1760 with a very beautiful stairway in two flights. (Fig. 166). Of his numerous church buildings we mention only the Pilgrimage church on the S. Nicholasberg near Würzburg, called the Chapel (Kappele), a central building with circular domed interior, which is enlarged by three great elliptical apses and a vestibule on the fourth side. Of the two slender facade towers and the little addition to the tower like a lantern over the central point, we have already given the upper portion. (Fig. 112). In the Pilgrimage church at Vierzehenheiligen (1743-1772) and the Abbey church at Neresheim (1745-1792), Neumann accomplished extremely important things in boldness and freedom in comparison to the previous mode of treating the interior. At the church at Vierzehenheiligen the ground plan (Fig. 167) is indeed **externally** enclosed by straight lines, like a cross-shaped basilica; in the interior it is composed of three

ellipses arranged beyond each other lengthwise, of which the middle and larger one is surrounded by four massive piers with side rooms like side aisles and two circular rooms arranged between the two front ellipses instead of transept arms. In Neresheim the church forms an undivided long building with a great elliptical middle room, adjoining which at each side are small ellipses as transepts and two large transverse ellipses. (Fig. 168). All ground lines of the interior are curves. Thereby is produced a grandiose animated architecture, which affords an abundance of charming perspective views. (Fig. 169). Although the richness of the decoration planned by Neumann was never executed, the impression of the interior of the church is indescribably grand. Since the days of Christopher Wren (page 204), no architect of the West has dominated the internal treatment in regard to suitability, magnitude, proportion and construction in the same measure as the Franconian master; but in art imagination, the treatment of forms and in the absolute independence of the traditional laws of harmony, he has far excelled the great Briton. Neumann gave its stamp to the entire Rococo art of Franconia, and even in the Rhine provinces, he exerted a deep influence by his extensive works for the elector's court at Cologne.

In the smaller states of Saxony and of Thuringia adjoining the Franconian North, the principal activity of the period still falls in the 17th century. In Gotha Andreas Rudolphi built for duke Ernest the Pious in 1643-1654 his chateau of Friedenstein, an imposing and massive building of almost a fortress character. Three wings enclose a rectangular court 282.2×213.3 ft., whose front is closed by a wall with a gateway. Wide towers flank the angles. The court receives an animated appearance by the arcades on massive piers extending around it. The Weimar Moritz Fichter erected after 1651 the palace as a U-shaped plan in earnest and heavy detail forms, almost free from all ornament. (The existing subdivision dates from a rebuilding and enlargement executed after the fire of 1774. Of the chateau at Eisenberg built after 1677 only the Protestant chapel is noteworthy, a hall church with a series of corinthian columns, which support galleries rising in

three stories. The great church at Weissenfels (1664-1690) has a character similar to that of the chateaus of Weimar and Gotha. The chapel was designed by Sturm as a model (page 136u). Like that at Gotha, it is a simple hall church with galleries and without a special altar space. On these buildings appears externally the changed architectural tendency almost wholly in the omission of the pediment so characteristic of the German Renaissance. Yet in the interior the Barocco character is shown in the mostly still immature stucco decoration, frequently recalling the gristle style, which in the low and narrow interiors shows quite oppressively. In the 18th century in this architectural province scarcely any but small villa-like chateaus originated, among which are the ducal hunting chateau of Belvedere near Weimar (1724-1732), that only shows on the exterior a richer treatment (Fig. 170) and in the interior a simple Rococo, and in Gotha the chateau of Friedrichstal (1711) all in the simplest treatment. They have a chiefly French character.

In Hesse after the end of the 16th century immigrant Huguenots in great number found willing acceptance and extended widely; they also soon obtained a strong influence over the court and the entire spiritual and art life. The plan of the palace in Darmstadt designed by their architect Jeremias de la Fosse was calculated for very great dimensions, but only a portion was executed (1716-1727), indeed in very reserved but refined and graceful architectural forms. In Hanau the Huguenots laid out the new city (Neustadt) on an entirely regular plan. Frankfort-a-M. received in the palace of Thurn and Taxis, built in 1732-1741, now belonging to the General Post Office, an imposing Barocco structure, that was designed by Robert de Cotte (page 75) and erected by an Italian, Dell'Opera, in the form of plan and the architecture of an important Paris mansion of that time. At Mentz the Dalburg Hof (1715-1718), now the palace of Justice, is a separate appearance among the architectural monuments of Rhenish Barocco architecture. The very luxuriant forms recall the Prague art of the Dientzenhofers. Far more moderate in the architectural treatment, even if also otherwise rich in decoration is

the palace of the German Order, now palace of the grand duke, built by the original creator of the plan of the chateau of Bruchsal, A. Fr. von Ritter zu Grünstein in 1720-1727. On it only the middle projection toward the court rises to greater magnificence. The arsenal (1738-1740) built by General Welsch, a master inclined toward French Classicism, has a tasteless but intelligent reserve. On the charmingly located chateau of Biebrich on the Rhine (begun 1704) is expressed in very restricted proportions, in the cold and dignified architecture and the rare ornamental work, almost entirely consisting of garlands in the sunken panels over the windows, the Huguenot-Dutch school. (Fig. 128). The circular middle building contains a domed hall with a portico and a coffered vault. In Treves the elector Franz George von Schönborn took into his service the Franconian master Neumann (page 180). His school is recognizable on the palace, now used as barracks. The palace of Kesselstadt (1742) built by Joh. Val. Thomann from Mentz exhibits a certain strain of the Vienna Barocco style.

At the court of the elector at Cologne was employed Joh. C. Conrad Schlaun, trained in the spirit of Neumann. He designed the chateau of Brühl located near Bonn (after 1725) as a U-shaped plan with a rather narrow court, and had charge of the building until the year 1728; from then it was in the hands of Michel Leveille. After 1740 Neumann had (page 186) the dominant part in the building. The chateau is famous for the imposing vestibule, the magnificent stairway (Fig. 171), in which the doubled flight rises on coupled Composite columns, and for the festal hall arranged beside both and picturesquely treated with aisles. A charming creation is further the chateau of Benrath near Cologne, built in 1753-1760 for the elector Carl Theodore of the Palatinate by his court architectural director Pigage (page 172). The well conceived ground plan, consisting of a domed hall lying on the axis with adjacent apartments and the entire architectural treatment, that exhibits a simple dignity on the exterior of the one story structure, but in the interior already introduces the transition to Classicism, manifests the penetration of the art spirit prevailing in France at that time.

NORTH GERMANY in its western architectural regions is chiefly under the influence of Rhenish art. In Westphalia the previously mentioned Schlaun was the architect most esteemed. On the palace of Erbröstenhof at Münster erected for the counts of Droste-Vischering after 1757, the master had the problem of erecting at the crossing of narrow streets a stately palace. Schlaun placed the principal axis on the line bisecting the angle formed by the two streets, then set the facade so far back, that a nearly quadrant-shaped court was left free, which he enclosed by a grille with a splendid gateway at the extreme angle. From this opened to the visitor an astonishingly picturesque view of the facade built on the curved ground line in two and a half stories, on which is charmingly arranged the pavilion at the middle with the projection from it. The chateau at Münster first erected for the prince bishop Friedrich of Cologne after the plans of Schlaun is a U-shaped plan with broad court of honor, narrow wing and a middle pavilion on the principal building, from which is a rich projection with a pediment. (Fig. 172). There as on the Erbröstenhof, the wall surfaces of the recessed portions are built of the native red brickwork, whereby an earnest and unquiet impression is produced, unusual in the other Barocco chateaus.

Cassel became a flourishing haven of the Huguenots and of their artistic endeavors, as being the capital of the landgraves of the electorate of Hesse, favoring the reformation.

In the domain of architecture the members of the artistic family of Du Ry (Dury) were its chief representatives. Their activity in Cassel was introduced by Paul Du Ry, born in Paris, who with Marot and the fortification architect van Coehorn (page 172) was in the service of the stadtholder William of Orange, then in the year 1684 obtaining an appointment as captain of engineers from the landgrave Charles II in Hesse Cassel. In the year 1688 he began to lay out for his countrymen the suburb of Oberneustadt (upper new city). It received the stamp peculiar to the Huguenot cities, which we have already considered (page 111). In the centre of this part of the city he built in 1693-1706 the French church on an elongated r

rectangle with a hipped dome in an extremely simple style of architecture, only characterized by a finely **profiled** pilaster order. The chateau of Orangerie built in 1701-1711 in the Au has a strong Italian tendency, produced by an Italian journey of the landgrave Carl; but in the plan and architectural treatment the French-Huguenot feeling in form predominated. one would not err in ascribing this architectural work to Paul Du Ry (died 1757), who approximates to the German art and with the grace of the French style of architecture softens and clarifies the oppressive forms of the German Rococo. His chateau of Wilhelmstal built near Cassel (after 1753) was dictated by French art taste in the ground plan, entirely calculated for suitability, and in the external architecture inclining to classicism, but the interior was decorated in a refined manner, more graceful and dignified than the heavy and pompous Rococo. (Fig. 173).

In Brunswick the German architect Fleischer erected chateau Richmond (about 1760), that exhibits a peculiar plan, entirely characteristic of the routine solution of the ground plan in the Rococo period. The building has a square ground area with the principal axes arranged on the diagonals. At its angles is built a projecting rotunda extending the entire height of the structure (1 1/2 stories), the front of which contains the vestibule, the rear having the festal hall. The other rooms are very skillfully grouped around these principal apartments. The external and internal architecture is restricted within the bounds of the classicistic conception prevailing in France at that time.

Hamburg received in the church of S. Michael erected in 1751-1762 one of the principal churches of German Protestantism. It was built by Ernst George Sonnin (1709-1794) from Brandenburg with the aid of Joh. Leonard Prey, who was engaged in Dresden under Bähr in the erection of the Frauen church there. The retaining of the foundations of the nave church, built in 1649-1651 and burned in 1750, led to the insertion of a transverse aisle, so that a Greek cross originated with a polygonal choir (retained from the old church) and a tower 433.2 ft. high over the main entrance (burned in 1906). The

very **imposing** effect of the interior is even increased by the decoration recalling the Frauen church at Dresden, but infinitely richer in S. Michael's church.

In Berlin Jon. George Memhardt (died 1687), called from Holland about 1650 to become the elector's architect, led in the great architectural activity at the electoral court. The city plan designed by him with wide foresight of the architectural development of the still small capital of that time, to which the broad street of Unter den Linden and the Friedrichstadt owe their present form, is the highest undertaking of the time in the laying out of a city. Memhardt also at the command of the elector planned the chateau of Oranienburg, whose middle building composed of three stories was alone subdivided by a Corinthian pilaster order comprising the two upper stories and wide angle projections with almost entire rejection of ornamental treatment. From 1690 onward Joh. Arnold Nering (died 1695), probably from Holland and likewise trained in the Dutch sense, continued the building further; he enlarged it and completed the internal architecture. At the same time Nering was engaged on the electoral palace at Berlin (volume 2, page 316) with Mich. Mathn. Smids (born 1628 at Rotterdam, died 1692), who had previously been employed with Memhardt in Berlin. He erected there with Smids the arched structure extending along the Spree as the termination of the third court in a noble, even if tasteless and entirely plain style of architecture, which is limited to arches in the ground story constructed of ashlar and to simple window enclosures with caps in the upper story. Nering also began about 1695 the arsenal, important in the history of art, but he could not have been engaged on this more than a few months. The ground plan forms a square of 295.3 ft. on a side with four wings around a court 128.0 ft. wide. The design is ascribed (by Gurlitt) to the director of the Paris Academy of Art, Francois Blondel (page 95). The severe design, the finely treated and truly French handling of the profiles, the dignified reserve, the lack of ornamental show (Fig. 174) permits the predominance of the French art spirit. (See the part taken by Boët on page 195). By Nering was the design for the Parish church at Berlin, built in 1695-1703. He chose for it

the central plan in cross form, when to the square principal room, 59.1 ft. in the clear, he added four semicircular apses.* The erection was placed in the hands of the native master, M. Martin Grünberg (1655-1707), and after the rejection of the dome, the very beautiful tower over the entrance was erected by Philip Gerlach (1679-1748). In the traceries in the windows and the buttresses of the apses is expressed a late imitation of the Gothic.

** With regard to this building, Sturm had rejected the cross plan as unsuitable for the Protestant church.*

171 A splendid advance was made by Berlin art at the time when the highly gifted Andreas Schlüter (born 1664 at Hamburg; died 1714 at S. Petersburg) was called to Berlin (1694). He had first worked in Danzig, then at the court of the Polish king Sobieski in Warsaw, where palace Wilanow indicates his assistance (page 227). In Berlin Schlüter was first engaged as a sculptor on the Royal palace, and likewise on the arsenal, whose supervision was taken by Martin Grünberg after Nerling's death. On it he created the famous masks of dying warriors etc. above the ground story windows of the court. From 1698 to 1706 he was the leading architect of the rebuilding and extension of the Royal palace. He designed a grandly arranged plan, but which was only partly executed. By him were the three wings on the southeast, southwest and northwest enclosing the inner (middle) court of the palace. The architectural forms are developed from those of the Roman high Barocco. (Fig. 175). Their treatment exhibits a certainty and weight, such as appears nowhere else in Germany at this time. Schlüter's gifts substantially show themselves in the interior decoration. The stairway in the southeast wing is a splendid work of monumental interior architecture executed with great architectural expedients and rich sculpture. The apartments adjoining this (the so-called state apartments), in the richness of invention, the picturesque ground tendency and treatment of the forms of the stucco decoration have much similarity to those of Effenner in the chateau at Schleissheim. Schlüter desired to erect an architectural masterpiece in the Lustgarten Place, the so-called Mint tower. After this had

been carried to a considerable height, it had to be torn down in 1706 on account of structural defects. Thereby Schlüter fell into disfavor. He was indeed further employed as sculptor, but in 1713 obeyed the call of Peter the Great to St. Petersburg, where he soon died in the following year. Schlüter was a powerful, independent and individual artist nature and one of the more important masters of the German Barocco. His strength indeed lay less in architecture than in creations in sculpture. These ensure to him -- the monument of the Great Elector in Berlin is the most prominent work of sculpture of German Barocco art -- a place of honor in the history of art.

After Schlüter's dismissal, Jon. Fried. von Hoesander, called Göthe (born 1670 at Riga, died 1729 at Dresden) was appointed director of the erection of the palace. He retained this office from 1707 to 1713. Hoesander was a chief opponent of the severe academic classicism. He therefore stood in strong opposition to Schlüter, in which Sturm seconded him (page 137); he first by the influence of his adviser won to his ideas the queen Sophie Charlotte, inclined to a scientific conception of art, and then likewise the king Friedrich I. At the command of the queen he carried further after 1701 her summer residence, the royal chateau at Charlottenburg, which Nering had begun in 1695. He there appears to have built the two wings, that enclose the court of honor measuring 249.4 ft. square, and likewise the very impressive domed tower 150.9 ft. high. (Fig. 176). In the internal decoration of the chateau chapel and of the porcelain chamber, he proved himself a skilful and refined decorator. At the palace in Berlin, in order to obtain the "great internal perspective" desired by the king, he extended the two facades toward the Palace Place and the Lustgarten Place. With regard to the already existing parts of the building, Schlüter's facade system was retained and only the northwest projection and the western facade were executed according to Hoesander's designs. But even if the west portal, imitated from the Arch of Septimius Severus in Rome (volume 1, page 138), has a great effect, their architecture no longer stands at the height of Schlüter's creations, full of life and character.

More personal, more full of imagination and refined are the works of the likewise classical Jean de Bodt (born 1670 as the son of a Mecklenburger in Paris; died 1745 at Dresden; page 177), yet designing in the sense of the French-Dutch art tendency. His activity in Berlin began in the year 1700. He was there first engaged on the arsenal, developed its facades and indeed the beautiful middle structure of the principal facade (Fig. 174), in an entirely independent way. Of great influence on the development of the later Berlin architecture was the magnificent portico with domed tower (1701) erected by him for the palace guard and to enclose the open side of the court at the City palace at Potsdam, whose grace recalls the works of French art of Mansard.

Under the reign of Friedrich Wilhelm I (1713-1740) a stop occurred in the court architecture of Berlin. The unpretentious, energetic soldier king, disinclined to the French nature, sought to restore the finances of the young state by wise economy and farseeing political measures, that had been ruined by the abundant activity in building and the luxurious court of his predecessor. When he closed his eyes, he had brought the country again to a flourishing prosperity. His son Friedrich II, the Great (1740-1786), zealously took up again the activity in art begun by Friedrich I. He found in George Wenceslaus Knobelsdorf (1699-1753) a German master of rare endowments, who had prosecuted zealous studies both in Italy and in France. In him was combined in a very happy way an expressed classicistic tendency with a refined feeling for the decorative charm of the Rococo style. His Rococo is freer and more imaginative than the French; it is in particular characterized by a luxuriant and rich naturalism. The structural basis almost entirely disappears in it. In an extremely easy manner the ornaments extend over the walls and ceilings, the hand being only guided by picturesquely ornamental considerations. In the treatment of the facades he followed the ground principles established by Boffrand. He was there a classicist, but more animated and personal than his Paris contemporaries in art. In Charlottenburg Knobelsdorf erected the eastern wing of the Royal palace, which in the upper sto-

story contained the "golden gallery" 131.2 ft. long and some living rooms, in a magnificent and splendid Rococo. From 1741-1743 he built at Berlin the Opera House, but of its internal arrangement only the Apollo hall remains in its original condition. The facades and especially the vestibule, treated like the front of an antique temple with six Corinthian columns, are designed in a thoroughly English-Palladian purity. In Potsdam Knobelsdorf had charge from 1745 to 1751 of the rebuilding and extension of the City palace, to which he gave ~~on the exterior~~ a severe and classicistic architecture, but in the interior again a showy Rococo ornamentation. The French church built there by him from 1751 to 1752 is a weaker imitation of the Pantheon in Rome on an elliptical ground plan according to scheme F in Fig. 121. His principal work is the palace of Sanssouci placed in the royal gardens (1745-1747), the favorite residence of Friedrich the Great, for the plan of which the king himself made sketches. The facade is 318.3 ft. long, one story, and it rises above three steps, and is interrupted at the middle by a strongly projecting elliptical rotunda with dome, that contains the principal hall. The series of rooms arranged at each side each terminates in a circular hall. On the garden facade by the arrangement of the king, who may have indeed opposed the master, always treating the exterior classically, instead of columns or pilasters are employed animated pairs of Barocco hermes, between them being high round-arched windows. (Fig. 177). They produce an unusually picturesque and imposing effect. On the entrance facade on the contrary ~~in the~~ semicircular projecting colonnades with coupled Corinthian columns, whose motive is continued on the facade, Knobelsdorf's art appears in entire purity. The interior exhibits in the main hall a grand subdivision by doubled marble Corinthian columns projecting from the wall and with a severely profiled cornice with consoles, otherwise in an elegant and extremely rich naturalistic Rococo with the master's matured individuality. We also see here, now in the last and most important Berlin representative of the most flourishing Rococo, the new classicism counterbalanced that. After his death the architecture-loving king had a design prepared (1755) for a new palace of Friedrichskron

near Potsdam by Joh. Gottfried Bähring (born 1723 in Berlin) with the assistance of the architect Manger, which was only executed in 1763-1766. Even there the king made his influence felt, and who had been in Holland in the year 1753. The architectural members were constructed of sandstone, but the wall surfaces remained in brickwork without stucco. In the ground plan consisting of a main building with projecting wings, the great stairway is wanting. The apartments are decorated in a luxuriant Rococo, but which is no longer characterized by the refined development of Knobelsdorf's ornamentation. The facades have a single colossal order of fluted Corinthian pilasters, comprising the two and a half stories, and a massive main cornice with consoles and with crowning balustrades and statues. (Fig. 178). The powerful relief decoration of the German Rococo here again animates the severe Dutch-classistic architecture. But it appears only as if applied, almost by compulsion, like an addition from an already departed time.

The then appearing master of Berlin architecture, Carl von Gontard, had already entirely renounced the Rococo. Therefore we shall follow his works in the next Chapter.

6. Architecture in the Period of the Barocco and Rococo styles in England.

I. Historical Evolution and Style.

In England the high Renaissance had prevailed until about 1665. The advance at about that time in political and social conditions also led to a similar one in the art life. When Charles II (1660-1685) after his exile had returned to the English throne, his jolly inclinations, his love of show, and his endeavors for the external glorification of the monarchy soon appeared. After the precedent of Louis XIV, in whose country he had lived for a long time, he desired to appear as a Christian monarch, and he supported and favored Catholicism, without regard to the fact, that England was almost entirely Protestant. But also like the sun king, he wished to taste fully the cup of the enjoyment of life. The English court became the scene of the most unrestrained dissoluteness and passion. The example thus given was not only followed by the nobility, but likewise by the people, previously subjugated by the war and by the hated Puritanism. The leading spirits, who had been before engaged in the contests for politics and religion, then turned to the polite arts, to the sciences and the arts.

The royal court was inclined to the Barocco style as offering a splendid show. But the nation adhered to its traditions with the firmness inherent in its blood. In the dissensions between the Catholic court and the Protestant people were opposed two parties, which determined the tendency of architecture according to the strength of their influence. The respect for the crown was most greatly reduced by the love of pleasure and of extravagance of Charles II. The national prosperity diminished. With king William III of Orange (1689-1702), the Stadtholder of the Netherlands, a Protestant monarch came to the throne. Under his reign the country took a great economic advance, that had a strong development of architectural activity as a result. Men brought to architecture a lively interest. Even the court circle and the nobility occupied themselves with architecture as a science and with its principles. The architects enjoyed a highly esteemed

position. The union of Scotland with England as the kingdom of Great Britain was completed under queen Anne (1702-1714) and produced a considerable increase in the power of the crown and of the circle of interests of the nation. The increased spirit of adventure of the entire people was expressed in the enhanced activity in architecture. This was also much favored by the queen. But the succeeding monarchs took little part in it. So much the more animated was the interest, that the nobility devoted to the architectural endeavors and undertakings.

The evolution of the style of English architecture under the given conditions must be carried out in a different way, than that of the contemporary art in France and in other countries ruled by absolute monarchs. The English state was not as centralized as those. London unlike Paris and Rome did not form the intellectual centre of the nation. Absolutism had never been able to strike root as in France. The English people had won its freedom by severe internal conflicts, and understood how to preserve the rights of individuals. It was too conservative to give up its earlier acquisitions. Already during the preceding epoch had it adopted the teachings of Palladio in their entire extent. To the art philosophy of the Englishman was it particularly near to strongly emphasize one requirement of the great Vicentine, that of truth. Like Palladio, he saw in the antique that art, which corresponded to that requirement in the highest sense. The influential philosopher, Anthony Ashley Cooper, count of Shaftesbury (died 1713), established principles for art criticism, in which he would always have the organism considered as a whole, and designated the internal truth and naturalness as the supreme guide for every form.

In architecture this conception led to carefully weighed and distinct architectural ideas, to unified forms with a strict subordination of the masses and members to the whole. It was the Palladian classicism, that dominated the architectural creations of the English architects, indeed at a time, when in Germany, Belgium, France and Italy the Barocco style still celebrated its orgies. The leading master was Christopher Wren. (1632-1723).

But the architecture of the court could not entirely reject the Barocco. It required at least an approximation to this, which was carried out by the second principal master and contemporary of the preceding, John Vanbrugh (1666-1727). This approximation was indeed scarcely expressed except in the Barocco designs for interiors, in the massiveness and the increased labors for grand effects, by their nature Barocco. In the architectural treatment of forms even therein the classicism also maintained supremacy.

But the English were not opposed to classicism with an exclusive recognition of its supremacy. The revolution fought through by them had as a result toleration and free thought; as in the religious, so likewise in other intellectual and art questions. Men desired to preserve independence in the decisions, on what they found good and appropriate. * It is no accident and not merely an artistic occurrence, that about the end of the 18 th century, men also returned to the primitive national art style, to the forms of the Gothic middle ages.

** In the art of its citizens was developed at the beginning of the 18 th century that freely conceived Queen Anne style (1702-1714), characterized by the return to simplicity and plainness, with which the later architecture of the citizens was again connected. Besides the style tendencies of Jones and of Wren, this also adopted Belgian and Dutch architectural motives, employing them in combination with brick construction in a certain easily intelligible correctness. The good solutions of the ground plan, that characterize English architecture for centuries, came to establish particularly in the Queen Anne style an intelligible and characteristic domestic architecture.*

After the deaths of the two entirely creative great masters appeared theorists, who under the influence of learned studies with more acute perceptions busied themselves with architectural expression in itself, with the style forms. In their eyes the theory of proportions was the primary requisite for every beautiful effect; something prescribed, from which one could not diverge without a great injury to the appearance of

the art work. One of the theorists (John Wood) even went so far, as to prove the theories of Villalpanda (volume 2, page 239) by further passages from the Bible. The canon established by Palladio was again esteemed as the alpha and omega of all higher art wisdom. But men no longer penetrated deeply enough into the spirit of the great masters of the Italian late Renaissance, but understood their teachings quite superficially. Such an art strictly according to rule, as the English deduced from their works, must soon be petrified in a lifeless formalism. Colin Campbell published the "Vitruvius Britannicus" (London, 1715-1731), so important for English architecture. Numerous other publications treated the art as a science. On many of them French art had an undeniable influence. Certain French works were translated into English. Otherwise men chiefly busied themselves with the drawing and reproduction of the most important creations of architecture. Likewise those of the earlier native art of Inigo Jones again came into consideration and importance as a model. The strong interest taken by the public in the floating art questions was almost exclusively devoted to architecture. The minor arts, that flourished so luxuriantly at that time in France and Germany, there stand entirely in the background.

With the almost unexampled glorification of classicism the return to mediaeval forms is a particularly interesting phenomenon of English art life. But it was unavoidable. Shaftesbury already in his widely read writings had established theses, which in the following period of national culture were regarded as authoritative. Every unprejudiced observation of the Gothic monuments standing before their eyes must lead to the recognition, that also ~~this~~ art entirely corresponds to the generally established requirements of well graduated magnitudes, of simplicity, of subordination of the masses and members to the whole, of truth and naturalness. It only required an external impulse for its public recognition, and this came from Scotland, where the romantic sense lay deeply within the souls of the people, and where the enthusiasm for the landscape expressed itself in the close relations of art and nature. Already in Wren's time and in his works appear

in slight beginnings of romantic tendency beside classicism. This found in a characteristic way animated approval in the broader masses of the English people, then among the leading masters. In the year 1742 was published the first work on "Gothic architecture", that gives a historical description of the Gothic style, speaks of "Gothic orders" and gives models for the treatment of clustered piers, for tracery, battlements, finials and the like. It also gives that kind of cap, that is formed by a moulding broken around the window lintel, cut off at each side with a short horizontal addition, thus being a form, which later found such wide extension on the continent as well.

Romantic tendencies and the love for nature also led in England to an entirely new treatment of the garden architecture. More closely than in any other country of the West, the residence there stands in direct relations to nature. The Englishman had from before a special love for living in gardens instead of walled streets. He did not build a house and then add a garden to it, as occurred in Italy and France, but he sought in the ground area available the most favorable site for the house between the already existing meadows and the groups of trees. The landscape was thus given; the house was added to it. With the Renaissance was adopted the architectural design of the garden, and in the 17th century the French garden style (page 83 *). But in one point differ the gardens laid out in England from French models, particularly in that men took into consideration the natural form of the ground, far more than in France. Men included hills, great clumps of trees and the like in the plan, treated the great alley as a lower surface, arranged flower beds and separate divisions, which were to serve as botanical or as useful gardens. Special attention was devoted, that from definite resting places picturesque views should be afforded over important portions of the landscape. Men also sought to utilize and to enhance the beauties afforded by nature. They also soon avoided the rectangular subdivision. To the watercourses were left their natural undulating windings, and following these winding curves were also given to the garden walks. Thus grad-

gradually until about the middle of the 18 th century in England was developed an individual style, that of the "English garden", independent from the French design and in many respects directly opposed to it. It was an independent result of the strongly emphasized requirement of truth and naturalness, in the further pursuit of which men must come to the conclusion, that the arrangements produced by nature were the sole models, and that one must **derive** the conception of beauty of gardens from nature itself; the ideal of garden art being to be sought either in the careful fostering of natural gardens, or in new forms in imitation of such. This imitation was conceived as chiefly consisting in the combination and collection of natural landscape phenomena, somewhat as the eye of the painter sees and reproduces the beauties of nature. The English garden then presented portions, often even miniature views of English landscape, in which light green lawns on slight swellings of the ground and shady groups of trees with comparatively limited perspectives form the chief phenomena.

** In the year 1670 Lenotre (page 83) came to London, and there laid out Kensington Gardens, which in many ways recall the design of the palace gardens at Versailles.*

The severe tendency of absolute naturalness, avoiding all artistic aims -- men even dug up dry trees and set them in blooming gardens -- about the middle of the 18 th century, when men had become acquainted with the Chinese gardens, aroused an opposition on the part of certain artists, who judged these English to be too dry, too little adapted to produce a artistic and poetic harmonies. They saw the higher ideal of garden architecture only in the combination of art and nature, in the combination of lawns and booths, clumps of trees and temples, bridges and rocks etc., after the model given by the Chinese. **These** now came into their designs temples, pagodas, artificial ruins, particularly those of mediaeval character, and even mosques, to which no other use was assigned, than to enrich the views in the garden and to strongly arouse the imagination. We see therein expressions of the romantic tendency worthy of consideration, which dominated the intellectual and artistic life of the succeeding period.

II. Most important Monuments.

The most prominent master of English architecture for a generation, Christopher Wren (1632-1723), was first engaged as mathematician and professor of astronomy in Oxford, but in 1661 came into relations with architecture as assistant of the chief superintendent of buildings and thenceforth devoted his principal interest to it. In the year 1665 he went to Paris, where he studied Perrault's classicism on the Louvre, and some years later also to Italy, where he became acquainted with Bernini and followed his works on the church of S. Peter. Wren was an artist nature on a grand scale, whose strength chiefly lay in construction. In his buildings were employed all systems of vaulting with great certainty. They are models in this respect. The Barocco spirit scarcely appeared except in the powerful enhancement of the general impression and in the preference for great expedients. The architectural treatment is of particular purity and strength, with a sharp drawing of the members in the sense of Palladian art. (Figs. 179, 180). Only in the ornament are Barocco forms occasionally perceptible. Wren showed himself an expressed representative of a scientific conception of art, that evidently entirely corresponded to the English; but he was also a typical representative of the proud feeling of the citizens and of the bold and energetic spirit of the English nation.

After the great fire in London in the year 1666 architectural commissions fell to Wren, as were scarcely assigned to any other master in the same extent and greatness. Particularly fertile was his activity in Protestant church architecture. He prepared nearly 100 designs for churches, more than half of which were executed. As a convinced adherent to Protestantism, he created purely churches for preaching almost without exception, for which he prescribed many new solutions of the ground plan. Where existing portions of buildings were not to be utilized, he chose central plans as a rule, and according as the ground area permitted, he developed in the most diverse variations from the simple hall church to the complicated polygonal or oval domed church and its combinations with longitudinal structures. For the form of ground plan and the dimensions of the churches is responsible an Act

of the English Parliament of the year 1703, certainly originated with Wren's concurrence, according to which the plan of the church should be designed exclusively with regard to this, that the words spoken by the preacher should be clearly audible. The limits of hearing were fixed at 50 ft. in front, 30 ft. at the sides and 20 ft. to the rear. * Churches must not exceed 90 ft. in length and 30 ft. in width. In regard to the internal arrangement Wren left to the altar its traditional position as a rule. Behind and above it a broad window admitted abundant light. The pulpit was located without a fixed rule, most commonly at the side of the altar. It no longer appears as a fixed member in the architectural organism, but is treated as a reading desk and like furniture. The notable inclination in Protestant church architecture for the insertion of galleries, especially in Germany, rarely appears in England. In its place frequently occur moderately elevated galleries. The internal architecture is simple, chiefly intended for internal effect. Only the vaults have relief ornamentation. Variegated painting was almost entirely rejected. Also aside from some principal works and corresponding to relatively simple forms of ground plan, the facades received no richer architectural subdivision. The effect is chiefly based on the arrangement and the enclosures of the doorways and windows. On the other hand great attention was paid to the treatment of the towers. If they were designed in Renaissance forms, they consist of a square substructure comprising one or more stories, a main story erected above this and richly treated by pilasters or columns, an attic or balustrade and an octagonal or round spire, that is composed of several *loggia* or lantern structures placed above each other. (Figs. 131, 132). The masses are preferably treated in the series of antique forms. Wren did not restrict himself to these in the development of the towers; he returned to mediaeval models, even by preference. The greater number of the towers built by him are kept within Gothic forms, that indeed are not always detailed in the full purity of Gothic architecture, but always exhibit a bold grandeur and assured treatment. Wren was likewise the first representative of that gene

general conception common in the second half of the 19th century, that the architectural style should be selected and employed in accordance with the purposes of the different buildings, as the architect or owner thinks proper.

** It is to be considered here, that with the lack of distinctness in English speech, good hearing lies within narrower limits, than for example in Germany, France or Italy.*

The first church building of the master was the chapel of Pembroke college in Cambridge (1663-1665). This had a rectangular plan as a hall church with choir on the north and organ gallery on the opposite side. Among the numerous later and smaller churches the church of S. Bride in Fleet St., London, commenced in the same year (1661), and especially S. Stephen's church, Wallbrook, are the most famous. The former is a three aisled hall church (Fig. 180) with a tower (Fig. 182), with stairways in both leading to the gallery; the latter being a rectangular plan with included octagonal central area and small semicircular apse, beside which rises a tower.

A particularly grand commission was received by Wren in the building of the cathedral of S. Paul in London, that was to be erected instead of the Gothic principal church destroyed by fire. Wren was inclined to the central plan. He designed an octagonal domed area about which were arranged polygonal chapels on each side. On the principal axis, he extended this entirely symmetrical plan toward the entrance by a chapel and an open columnar portico, at the opposite side by a small semicircular apse as a choir. But this plan did not receive the approval of king Charles II, who as a zealous adherent of Catholicism required a consideration of the traditional basilican plan. The second design was executed in 1675-1710, and shows a combination of the central building with the basilica. (Fig. 133). An octagonal domed area occupies the entire width of the nave and in combination with four very short arms forms a Greek cross. Adjoining this on the main axis is a nave composed of three bays, before which is placed a small single aisled transverse aisle and an entrance portico between facade towers; on the other side lies a choir of equal width and likewise composed of three aisles with a polygonal

apse; at both sides of the domed area is arranged one bay of the same width as a transept. The dimensions are unusually great. In length the ground plan exceeds that of Cologne cathedral, and the height even surpasses that of the cathedral of Florence. The internal treatment (Fig. 184) exhibits the system of numerous Barocco churches; basilican plan, pier arcades with single Corinthian pilasters, horizontal returned cornice, above it being a parapet attic and windows, which intersect the vaults, the latter formed as circular domes. The facade (Fig. 179) has two storees, which -- in contradiction to the basilican structure requiring low side aisles -- are also carried around the sides at the same height, with horizontal main cornice and parapet balustrade, above which rise only the two front towers, the pediment over the facade of the middle aisle and the transepts on the transverse axis.

Extremely impressive is the treatment of the dome, that dominates the entire building. The drum is surrounded for two-thirds its height by an open portico with a balustrade gallery. From the crowning cornice of the upper part of the drum, constructed as a half story, rises the dome in a bold and elastic outline to the lantern, which in a peculiar way is treated as the reduced upper story of a tower. In favor of a well calculated external effect the great mathematician and theorist, who otherwise strove so strongly for truth and suitability, yielded many consequences detracting from the organism of the structure. As already indicated, the upper story of the side aisles is merely a sham architecture. The master resorted to this expedient in order to give to the colossal dome a corresponding substructure. Even this is a sham construction, that conceals the internal construction of the dome. The latter consists of a rounded shell stilted over the circular form, through its vertex opening being visible a second more strongly stilted shell built in conical form. The construction is developed with strict calculation and is a splendid work in execution. The architectural details of the external and internal architecture are correct, designed in severe classicism, but on the whole are cold and tasteless. Yet the effect of the interior is imposing, and likewise that of

the external appearance. The dome is majestically enthroned with its massive substructure above the sea of houses of the colossal city. S. Paul's cathedral is the greatest church of the Protestant world. It is artistically from a single spout, since the master was himself permitted to bring to completion his colossal work.

204 Wren's first creation in secular architecture was the Sheldon Theatre at Oxford (1663), a great hall structure intended for public assemblies, for whose plan must have served the Theatre of Marcellus in Rome. The exterior appears as a polygonal building with rusticated arcades in the ground story, a pilaster order in the upper story, coupled windows and an attic above the principal cornice, behind which rises an octagonal dome admitting light from above the centre. Among the numerous later secular buildings of the master -- there are attributed to him 8 college halls, 35 halls for city officials, 4 palaces and more than 40 other notable structures -- a are to be mentioned the Library of Trinity College at Cambridge (1676-1692), a wing treated in powerful and nobly handled forms of the Italian Renaissance, as well as the rebuilding of the eastern portion of Hampton Court, on which he produced a dignified effect in brick architecture with enclosures of cut stone. (Fig. 135). As the chief undertaking of Wren in the domain of secular architecture must rank his part on the Hospital at Greenwich, one of the greatest architectural works in the country. The extended plan spreads symmetrically at both sides from two courts lying one behind the other, and whose middle line coincides with the principal axis. The front and larger court has an approximately square area; it is open on the facade toward the Thames. (Fig. 136). At the middle of the inner side a broad flight of steps leads to the second court forming a terrace and likewise open at the rear side, narrow between two imposing domed buildings but very deep. At the two longer sides this is flanked by enclosed buildings only at the front and rear angles. The connection between these angle buildings is formed by colonnades. Through them one passes to another rectangular court, each of which is enclosed by three wings grouped in U-form. The outli-

outline of the general plan forms a rectangle of vast dimensions. The structures were begun by John Webb in the year 1667 as a royal palace for Charles II, but rebuilt as a hospital after the year 1694. The general arrangement of the buildings must be attributed to Wren, who executed the dominating portions of the structures, the two domed buildings and the colonnades.

Like his great predecessor Jones, Wren was an excellent architect in regard to the suitability of his solutions of the ground plan. His creations are distinguished by well calculated form and grouping of rooms, convenient connection and accessibility with abundant access of air and light. In his conception of art he does not, like Jones, stand directly in the path designated by Palladio; he rather inclines toward the elder Mansart. His grandeur, energy and freshness, his sound understanding of men and his sovereign power over space and construction ensure him a place among the most important masters of postmediaeval architecture.

John Vanbrugh (1663-1726), a contemporary of Wren and the most esteemed artist besides him, the representative of that art tendency, that placed itself in the service of the absolute princes and of the unscrupulous court life of the king and the nobility, was entirely a Barocco master of great gifts, cheerful, cold and graceful in his architecture, but too little severe with himself, for his works to be as well considered, carefully worked out and harmoniously completed as those of Wren. He soon found himself in violent contradiction with the spirit of the English citizen class, striving for truth and solidity. His buildings show externally a pompous grandeur. They have a colossal extent, frequently at the cost of the suitability and convenience of the solution of the ground plan. For the later works is notable a determining influence of French chateau plan on the arrangement of the sequence of rooms and the introduction of great galleries. The architectural treatment in general as well as in detail misses the refined feeling for the effect of the masses, of the proportions of the different parts to each other, of the members and the architectural work. In the treatment of the

forms with all other freedom, there reacts that classicism, with which we have become acquainted in its Dutch native land. In contrast to the vainglorious external architecture, which as a rule far exceeds the proportions given by the approval of the building, the internal art recedes. It appears neglected and is chiefly calculated to express hollow grandeur and repellent dignity.

Vanbrugh's first and also indeed his best work is the chateau of Howard Castle in Yorkshire, built in 1702-1726 for the counts of Carlisle. The ground plan is kept in very animated outlines and consists of an unusually elongated garden wing at right angles to the principal axis, which contains the usual series of rooms (perspective) after the model of Versailles. Before it lies the comparatively small middle building as the main structure, in which is found a circular domed hall on the principal axis with stairways at each side leading to the upper story. Narrow passages connect the middle building with the two wings, that form between them the great court of honor, open in front and rounded at the angles by arched galleries. The main building has a columnar order comprising two stories with round-arched windows, and above it extends a dome on a high drum. (Fig. 187). The side wings enclosing the court of honor approximate in their rustication to the French architecture of the Rococo period. Otherwise the form treatment remains within a simplicity recalling Dutch art. In the interior predominates a severe architectural subdivision. In the ornament appears the shell work in combination with a crisco naturalism in a usually dry modeling. The effect of the whole is based on the vast dimensions and the loose grouping of the architectural masses, that have in these conditions but few contrary examples. Vanbrugh was also engaged on the Hospital of Greenwich. But there but few parts of buildings, which can be referred to his authorship. As his chief work generally passes palace Blenheim near Oxford, that the English nation had built for the duke of Marlborough in gratitude for his famous deeds and in memory of his victory of Blenheim (Blindheim near Höchstädt in Bavaria, 1704), obtained in combination with prince Eugene over the Bavarians

and the French. The ground plan has several recollections of Versailles; a great court of honor enclosed in front by colonnades and diminished toward the rear by projections, in each wing being an internal court with the housekeeping rooms on the outside. The wings are connected with the master's residence by an open gallery. This follows the French model in the arrangement of the rooms. The architecture (Fig. 188) does not rise to an effect corresponding to the grandeur of the plan. The accents are wrongly placed and are too little balanced. The architect lavished abundant wealth on the decorations, where simplicity should have been, but on the contrary is plain, where a rich and powerful treatment should be expected. The forms of details are frequently neglected. The highest parts of the corner pavilions are architectural productions, that would make the architect trained in a classical sense shake his head. Likewise the internal architecture (Fig. 189) is scarcely satisfactory in regard to the organic development of the members in accordance with the purpose of the rooms and their proportions, in spite of the spaciousness and the expenditure for magnificence. The artistic importance of the palace lies in the picturesque grouping of the architectural masses, in the charming placing of these in the landscape, and the talented manner in which the master brought them into connection with the palace by ornamental architecture, bridges, circular temples, statues and vases.

A school pursuing his course farther did not adhere to Vanbrugh. Wren's style of architecture had a greater suitability to English needs. And thus this master had the satisfaction of seeing his art continued by a great number of pupils. Among them Nicholas Hawksmoor (died 1735) stood in the first rank. This architect was likewise much employed, inherited Wren's office as chief architect of the capital, and built the extensive chateau of Easton Newton in Northamptonshire (1713), which in grandeur of plan is hardly inferior to Vanbrugh's works.

While on the English soil of the island kingdom the three masters mentioned, and especially the two last, did not remain entirely opposed to the Barocco style, the school of Jones

was continued in the northern part, in Scotland. His most important follower there was William Bruce (died 1710), whose chief work, the chateau of Hobetoun House (1698-1702), repeats on a great scale the Palladian motive of Villa Rotunda. (Volume 2, page 230). William Adam (died 1743) later developed an extremely rich activity. His buildings are indeed inferior in greatness of conception to the contemporary works of English masters, but excel them by the richer treatment. He executed them in a Renaissance more nearly approximating the art style of Wren, but also was a restorer of Gothic, which is important in the history of art. The chateau of Douglas Castle erected by him is entirely executed in the native form of mediaeval castle designs.

In England the theorists succeeding the great freely creative masters (page 201) introduced a new epoch of the most severe classicism. In their works James Gibbs (1674-1754) stands in the first place. He was born in Scotland, made his studies in Italy, indeed in Milan at the school following Juvvara (page 38). His first work, the church of S. Mary le Strand in London (1717), is a one story design with a choir apse, a semicircular open portico before the facade, a rich two story facade architecture extending around it, and an elegant tower, that rising above the principal facade in a spirited manner, passes from the rectangular base into the square. His second and more important church of S. Martin-in-the-Fields in London (1721-1723) is more strikingly characteristic of the style of the master, and on account of its refined architecture obtained importance as a model. It has one facade tower consisting of two pilaster stories and an intermediate story for the clock, and a hexastyle Corinthian portico of noble proportions recalling the Superga near Turin. (Page 38). The antique temple facade according to the scheme established by Palladio was almost generally the rule for this time, not only for churches, but also for secular buildings. Gibbs was also the creator of the Radcliffe Library in Oxford (1737-1747), a peculiar, well proportioned and dignified circular building. (Fig. 190). On an octagonal rusticated substructure stands a columnar order of three-quarter Corinthian columns

comprising a principal and an intermediate story, which are set in pairs, with a massive cornice and crowning balustrade. Behind this rises over the central room in an elegant curve a dome with lantern. The lower story is not entirely free from French echoes; but the upper structure has powerful Palladian Renaissance forms. In the latter is also kept the two-story Senate House at Cambridge (1730), an entirely symmetrical plan, with a projection crowned by a pediment at the middle of the facade, which is subdivided by a columnar order. In the happy adaptation of his works to the given conditions, Gibbs proves himself to be the most gifted follower of Wren.

Colin Campbell (died 1729) from Scotland, frequently termed "Vitruvius Britannicus", has become known less by his architectural than by his literary activity (page 201). He celebrated Palladio as the highest master of true art, but otherwise was a zealous admirer of Inigo Jones, into whose paths he endeavored to again lead English architecture. Of his buildings, the chateau of Houghton hall in Norfolk, 1722-1735, is the best work. But the master was not permitted to entirely execute his noble design, a severe creation in the sense of Palladio.

Christopher Wren the Younger, the son of the previously mentioned great master, appeared especially in the treatment of the ground plan. His Marlborough House in London (1710) permits the recognition of the types of the plans of Vanbrugh's chateaus and perhaps forms a stage preliminary to them.

As a master with refined feeling also George Dance the Elder (1695-1763) was esteemed, the creator of the imposing Mansion House in London (1739-1753), which the spirit of the high Renaissance appears to influence with a clarification and heightening by classicistic grandeur. The facade (Fig. 191) has a Corinthian order standing on a low base and extending through two stories, a hexastyle portico with an attic and a balustrade parapet of extraordinarily noble design.

The severest among the theorists also belonging to the first half of the 18th century in regard to a purely scientific conception of architecture was William Kent (1685-1748). He also became known as a painter and particularly as the primary

creator of that English system of gardening, that desires in the garden nothing more than nature will give (page 203). Kent established a simple and noble dose of architectural works as the first requirement. He required severe moderation with intentional rejection of all superfluous accessories. In general he sought effect less in the members than in the surfaces. To the facades, besides the columnar porticos, he gave only carefully drawn cornices and modest enclosures for the windows. In the interior he preferred for the ornament of the walls recessed relief panels and niches with statues. At the transition from the walls to the ceiling he rejected the transition cavetto. Besides the coffered ceiling, whose panels he treated entirely with egg and leaf mouldings, rosettes and the like, he also employed beam ceilings. In the ornament acanthus scrolls, laurel branches and leaves in combination with griffins, vases, masks and emblems bear the same character, that appeared later in the Empire style. In this mode was executed under Kent's charge the internal architecture of Campbell's Houghton Hall. His best unified and completed work is chateau Holkam (Norfolk), the principal work of the matured English-Palladian classicism. The plan differs from the usual one in chateaus of this time, especially by the arrangement become common after French models, in a manner particularly characterizing English peculiarities. The living rooms are there placed in pavilions, which are far separated as independent buildings and only connected at the angles by narrow galleries like corridors with the main building, containing the proper festal and social apartments (Fig. 192). The reason for this is that in England it was desired to bring the living rooms into the closest possible connection with the garden, to have views of this on all sides. On the other hand the social requirements differed there from those in France. In France the social life and customs were dominated by the mistress, and her inclination for familiar and intimate comfort, but in England by the master, who even at their assemblies and feasts occupied himself with high politics and the discussion of important questions of the day, and required rooms for assemblages, which stood in no nearer

relations to those intended for family use. This arrangement of the ground plan enjoyed particular favor in the great English buildings of the 18th century; it is typical for the house plans published in Vitruvius Britannicus (page 201), in which the connecting galleries indeed mostly appear as quadrant-shaped colonnades. They presented for the structure the advantage foreseen in the plan, the allowing of the main building to appear more majestic. The facade of chateau Wolkham is distinguished by a colossal hexastyle portico on the principal axis, but it otherwise has a very plain treatment of the surfaces. As a second principal work of the master is to be mentioned the widely extended and treated with animation, palace of Horseguards in Whitehall, whose facade rejects columns and is satisfied with ashlar work and round arches in the ground story, with the same in the principal story of the middle and side projections. (Fig. 193). Kent, in his conception of art and in his entire external and internal architecture, was the direct precursor of the later Neo-Classicism.

7. Architecture in the Period of the Barocco and Rococo Styles in Denmark, Sweden and Norway.

In DENMARK in the second half of the 17 th, and the first quarter of the 18 th century, on account of the unfortunate participation of the Danes in the thirty years' war, producing wars with Sweden, the political and internal conditions were not favorable for a further development of architecture, that attained such a high stage in the Renaissance. First under Christian VI (1730-1746) and Frederic V (1746-1766), due on the one hand to the strictly neutral position of these two monarchs in regard to foreign events, on the other to the execution of beneficial reforms in the entire administration and the effective fostering of commerce and industries, was introduced an advance, which in the second half of the 18 th century caused Denmark to flourish greatly.

During this time the Danish court and intellectual life was principally under the influence of north Germany, and accordingly the development of Danish architecture, even if French and Italian influences sometimes appeared. The architectural activity itself chiefly lay in the hands of native masters.

The court and the entire population were converted to Protestantism and saw the most important architectural problem first in the erection of churches, that should correspond to the reformed church. In the new and flourishing capital of Copenhagen was erected in 1637-1656 the church of the Trinity, for which king Christian IV himself prepared the design. It is a three aisled vaulted hall church on a rectangular ground plan with the angles cut off at one end, and with a massive round tower attached at the entrance end (this was originally intended for astronomical observations). The plan of the church as a nave, the buttresses and even the position of the pulpit on a middle pier still allows the mediaeval arrangement to be visible. A free creation, exclusively considering the needs of Protestant worship, is the church of the Saviour at Copenhagen, built in 1682-1694 by Lambert von Haven, a central structure with a square principal room, that is enlarged on each side by a rectangular exedra. At the intersections of the lines of its walls stand four square piers, that support the cross vaults constructed of wood. In the entrance e

exedra is built a square tower, that in the top story passes into an octagon, and is crowned by a steep circular spire, around which an external free stairway is carried like a ramp to the apex, 295.8 ft. high. The construction is with brickwork in very simple Barocco forms. The principal work of Danish church architecture of the Barocco period is the Frederic church (marble) in Copenhagen. It was designed and begun in 1749 by Nicholas Matthew Eigtved (1701-1754; page 220), director of the Copenhagen Art Academy, was continued in 1795 by the architect Nicholas Henry Jardin (1720-1799), called from France. The structure however proved too large and too costly for the small country. In the year 1770 it was entirely dropped, but was again taken up a century later, and after a simplification of the plans, was completed in 1873-1894 by P. Mel-dahl. The ground plan (Fig. 194) forms a circular central room with a diameter measuring 103.0 ft. and surrounded by 12 wide piers, a very narrow outer aisle and two rectangular projections on the main axis as porticos, with stairways and subordinate rooms. On the one story structure rests the drum with the massive dome 262.5 ft. high, dominating afar the view of the city. This is constructed after the model of the dome of S. Peter's at Rome, but in its external appearance it loads very heavily the comparatively small substructure. (Fig. 195). The architecture remains within the forms of a classicistic clarified Barocco. The church is one of the greatest buildings for Protestant worship.

The more important secular structures exclusively belong to the 18th century. The small chateau of Fredensborg erected in 1720-1724 in memory of the Danish-Swedish peace concluded shortly before, owes its fame more to the grand park, whose wide and great alley is esteemed as particularly worth seeing. The Royal palace of Amalienborg was built about 1750 after the plans of the already mentioned Eigtved, who had been in Vienna, Munich and Rome, had worked under Pöppelmann in Warsaw and Dresden (pages 174, 227), and since 1736 had settled in his native land of Denmark. The Amalienborg consists of four separate palaces, treated entirely alike and originally intended as residences for the nobility, that are symmetrically grouped around the Amalien Place. The palaces have a rectangular gro-

ground form with wide projections at the middle. (Fig. 196). The ground story is rusticated, the upper story has coupled Ionic columns on the projection and pilasters on the receding parts, the whole with a form treatment, that with a Barocco keynote holds the mean between the academic Palladian classicism of the German and English conceptions. (Figs. 260 on page 302). The most important work of Danish Barocco architecture, the great palace of Frederiksborg erected in 1732-1746 under Christian VI, fell a sacrifice to a fire in 1794. It was then restored at the beginning of the 19 th century by Car. Fred. Hansen, but its principal parts were destroyed in the year 1884 by a second fire. The rebuilding and restoration of the palace (after the plans of Thorvald Jergensen) is a work of the most recent time.

NORWAY even appears in its political and intellectual dependence upon Denmark, lasting through the entire 18 th century (volume 2, page 320), to have retained much individuality, particularly to have gone further into the special requirements for Protestant church architecture. Of the two wooden churches erected in the 17 th century at Holmestrand and Arendal, the ground plan of the former is composed of three rectangular wings joined at an angle of 120° , but at Arendal of a regular octagon with rising rows of seats arranged like an amphitheatre beneath the galleries. The church of the Saviour at Christiania erected in 1695-1699 by J. Wiggers as a brick structure, is a single aisled cross church with widely projecting arms, a projecting square main tower at the entrance and a small polygonal stairway tower at the right hand angle of the facade. The exterior was restored in mediaeval forms in 1848 by the addition of plain cut stone architecture (granite). For the New church at Bergen (1700-1702) likewise constructed in stone, the T-shaped ground plan was chosen (see ground plan C in Fig. 121), with the addition of a square tower at the middle of the longer side of the principal wing. The very simple exterior recalls the German-Huguenot buildings, and by the heavy mansard roofs built over the wings rather appears as a hall structure, but does not lack the earnest character of a church.

The house architecture adhered to the traditional wooden con-

construction, whose warmth retaining material was prepared with great structural certainty in the mountainous country, exposed to the rough and violent winds from the North Sea, and it proved itself as particularly suitable. The residences of the nobles are a series of detached structures, grouped around a great court; among them the dwelling proper and the chapel, if frequently constructed of stone, had a preferred location and treatment. **Smaller** plans were frequently limited to three buildings; dwelling, kitchen and granary. The dwellings are rectangular one story buildings with gables at the ends. They enclose a hall extending nearly the entire length and the entire width and height, a small lobby, chambers at the rear end and a small attic beneath the roof. The hall is furnished with fireplace and smoke head and serves as dining room, also as a kitchen in the simpler citizens' and peasants' houses. For the construction the methods already common since the early middle ages were employed together, logs, posts and half timber work (volume 2, page 43; Fig. 197). In the wood carvings on the portals, windows, gable boards and on the house utensils, after the beginning of the 17th century appears a permeation of Renaissance forms (acanthus leaves and scrolls), and in the 18th century also of Barocco forms, which combine with the native northern linear ornament into a very charming decorative work.

SWEDEN. The thirty years' war had brought Sweden to a highly regarded position by the powerful participation of Gustavus Adolphus in the destinies of the people of middle Europe. Their state entered on its magnificent Carlovigian epoch. The famous deeds in war were followed, carried on by an impulsive national feeling, by just as animated as productive work for the needs of peaceful civilization. A series of culture localities for the arts and sciences were founded. Architectural activity assumed a rich development. Great chateaus, in which the nobility competed with the royal family, give evidence of the high stress of the energetic spirit of the time. But this prosperity was only of brief duration. Internal feuds between the official and feudal nobility had an injurious influence upon the carrying on of the grandly planned buildings. At the

end of the century broke out the so-called northern war, that lessened interest in the artistic development of life and severely shattered the general prosperity. In the second quarter of the 18th century the country gradually recovered in a longer period of peace, and therefore toward the end of the epoch architectural activity made a renewed advance.

The Swedish Barocco architecture has a predominating courtly character. It was in the hands of a few important masters, who had chiefly educated themselves by the study of the literature and of buildings in foreign lands. According as the impressions thus obtained preponderated, was determined the character of the different buildings. Therefore the development of the style was completed in entire dependence on foreign influences. Some types were formed, neither in the plans of palaces and churches, nor in the external or internal treatment. The first Barocco master was Jean de Lavallee (1620-1696), the son of the French architect Simon de Lavallee (died 1642), who had been settled in Sweden since 1637. After the death of his father, the younger Lavallee with support from the state undertook (after 1646) a study tour of several years to Italy, France and also probably to Holland. He worked in the sense of Palladio, yet with a leaning toward the Dutch conception of the teaching of that master. Beside him worked the more important Nicodemus Tessin from Stralsund (1615-1681). He likewise after 1651 made a journey to Germany and Italy, and it is assumed, returned through France and Holland to Sweden. In the year 1653 began his activity there, thereby introducing for Sweden a period of grand architectural construction. Tessin was the builder of numerous chateaus and city palaces. He had at command a very happy creative power and a finely developed feeling for pleasing proportions. His buildings have very good solutions of the ground plans, and in the structure clearness and dignified general appearance with all their richness. He was an adherent of the Palladian late Renaissance; but his style frequently recalls that of the elder Mansart in France. After his death his son Nicodemus Tessin the Younger (1654-1728) continued his work. He had also studied (from 1673-1680) in Italy, chiefly in Rome, but later also in France

and England. He proved himself a learned artist, who took as a model the Italian and particularly the Roman series of forms of the school of Vignola. The artistic inheritance of Tessin was transmitted to his son and successor in office, Count * Carl Gustav Tessin (1695-1771), but he entered the diplomatic service in 1741, and later as statesman and patron of the arts and sciences obtained much merit for Sweden. In his place was appointed his artistic colleague Baron Carl von Horleman (1700-1753) as the chief superintendent of buildings. Like his immediate predecessor, he chiefly worked in the sense of a transfer of the French Renaissance to Swedish soil.

* *Nicodemus Tessin the Younger was ennobled as count and appointed chief marshal in 1726.*

Among the monuments we first have to mention two churches, and indeed as the earliest the Catharine church at Stockholm (1656-1670), built by Jean de Lavallee. It is the first central church of Sweden, consisting of a great central square, from which project four nearly square wings of equal width, with small and likewise square additions in the angles of the Greek cross thus formed. The interior has a very spacious effect. The cross arms are covered by stone vaults; the octagonal wooden dome rests on the massive piers of the central area, over whose angles rise small towers like finials. (Fig. 198). The mighty and well subdivided structure forms a dominating building in the view of the city of Stockholm. The second great church structure in Sweden is the Cathedral church at Calmar, erected 1660-1690 by Nicodemus Tessin the Elder. The ground plan is here also symmetrically arranged. About a great central square are placed four short arms in the form of a Greek cross, of which those lying on the principal axis are each extended by one bay with a semicircular apse, at one end for the choir and at the other for the vestibule. In each angle of the cross arms stands a low square tower. The plan thus combines in a certain way the central building with the basilican system. The wall surfaces in the interior are subdivided by double Ionic pilasters, on the exterior by Tuscan pilasters in the lower, and Ionic pilasters in the upper story, in a severe design. As a creation of an interior the church makes an imposing impression; on the exterior the purpose of the struct-

structure as a church indeed is less clearly expressed.

In secular architecture chateau Skokloster near Upsala, built by field marshal Gustav Wrangel, known for his part in the thirty years' war, still stands under the strong influence of the Renaissance. It is planned as an enclosed square of four three and a half story wings grouped around a small court with polygonal angle towers. The high external walls have no vertical subdivision, aside from the very slight middle projections. The interior contains a magnificent three aisled vestibule with Ionic marble columns and a series of noteworthy rooms, in which in part still appear the strongly projecting mantles and the heavy stucco ceilings peculiar to Swedish architecture, but in part also developed Barocco forms occur. Evidently according to the sketches by the owner, the plan was designed by Lavallee and revised by the elder Tessin. Further advanced is Lavallee's best secular work, palace Bonde at Stockholm (completed 1667), an I-shaped plan with two story main building terminating at both sides in pavilions, from which project one story wings like galleries. The external architecture is executed entirely in rustication, and it still bears the tendency of the French-Dutch late Renaissance. The building is now utilized as a city hall and is greatly changed.

Swedish Barocco architecture reached its climax in the royal palaces. Among these the queen's palace of Drottningholm near Stockholm, erected 1662-1683 by Nicodemus Tessin the Elder and his son, has the same importance for Sweden as Versailles for France. In laying out the plan a great extent in length is avoided. To the principal building rising in three stories above an elongated rectangle is attached at each angle a strongly projecting pavilion but limited to two stories. Before each end is placed an approximately square court, that is enclosed by three wings of the same height as the angle pavilions. The ends of the longitudinal axis are accented by circular pavilions. The exterior (Fig. 199) is very simply treated. Its dignified effect is due to the happy proportions of the whole and the animated outline. The palace has an imposing and magnificent stairway occupying nearly the fourth part of the main building. The internal architecture reaches its cli-

climax in the royal chamber, that is entirely treated in the developed French Barocco style of Louis XIV. (Fig. 200). Far grander in plan and in the entire architectural treatment is the palace in Stockholm erected after 1697 by Nicolas Tessin the Younger. The ground plan consists of four wings enclosing a great square court. The two principal facades (on the north and south) are extended at both sides by low wings. These form at the east side a terrace with outlook on the Sea, at the west side being an external court, that is terminated by two porticos in a semecircular form. The architecture is built in three and a half stories, indeed without vertical subdivision on the northern facade, but on the east and west facades with wide central projections containing nine axes. That on the eastern wing shows a great Corinthian pilaster order on a high rusticated lower story, on the contrary on the west being Tuscan rusticated columns in the lower, hermes in the middle, and clustered corinthian pilasters in the upper story. The middle projection has but three stories; the intermediate story was there included in the height of the ground story. Before the south facade is a middle projection like a triumphal arch with five axes with Corinthian half columns, round arched portal at the centre, niches for statues in the other intercolumniations, and a crowning attic with trophies. Here the influence of the Roman series of forms becomes especially evident. Also the other architecture on the exterior, as well as in the internal apartments is dominated by it and is intended for assemblages, even if as particularly on the western facade, French and German tendencies cannot be denied. But otherwise the internal decorations have the expressed style of contemporary French art, that was transferred under the lead of the later palace architect, Carl Gustav Tessin, trained in Paris, and Carl von Hårleman (after 1741), by an artist colony called from France to Sweden in 1723. The completion of the palace externally occurred about 1741, of the interior only about 1777.

The true Rococo found entrance into Swedish art only in the interiors and the minor arts. Of Rococo buildings only to be mentioned is the little chateau of Kina (China), built in the

park of Drottningholm in 1751 and rebuilt after 1763, which should afford for the royal family a resting place after the disturbing court ceremonial in simpler surroundings, particularly for a stay in the free nature (like so many little country chateaus of that time named Hermitage, Monrepos, Solitude, and the like). It has a two story middle building with two one story wings projecting in horseshoe form and terminating in pavilions. The name of this small chateau indicates the enthusiasm of that time for everything Chinese, which also appears to superfluity in the details of the external building and in the internal decoration, particularly in the painted panels. The usually simply treated Rococo ornament recalls in its crisp naturalism that of palace Sansouci near Potsdam. the architect of the little chateau of Kina, K. F. Adelcrantz, passes in Sweden as already at that time a direct champion of Neo-Classicism. (Page 305).

S. Offshoots of the Barocco style in eastern Europe and in America.

In the kingdom of **POLAND**, as formerly in the period of the Renaissance (volume 2, page 316), so likewise in that of the Barocco style, Italian art first found entrance. At Warsaw masters from the school of Bologna built the church of S. Francis (completed 1733), whose low facade towers show the restraint on their creator in respect to development in height, and likewise the church of S. Joseph (completed 1782), on which was employed the motive from upper Italy of the construction of walls on arches between bent columns in a crisp Barocco style. In Cracow after 1683 the court architect Agostino Locci erected the great Capuchin church as a memorial church in celebration of the victory of the Poles over the Turks, and dedicated to the Transfiguration of Christ, which however is of but slight artistic importance.

To the secular buildings of Poland is peculiar the rectangular ground plan with strong projections at the angles in form of towers. The most important work of the period is the chateau Wilanow near Warsaw erected for king Sobieski (1688-1694). Likewise here an Italian master, Giuseppe Belotti, had charge. The ground plan received a rectangular middle building by the direct arrangement of the king, which at both sides is connected with two wings projecting at right angles by narrow gallery structures attached to the facade. Thus it has a form of plan, such as common in the English country seats of the 18th century. (Page 216). The relatively small principal building with nine axes has a high ground and a low upper story; over the middle projection with three axes and subdivided by a colossal order of Composite three quarter columns is built a high upper story. The broad and greater side projections with two axes exhibit Composite pilaster orders. The two recessed parts are each limited to one axis. After 1696 at each side of the main building were inserted tower-like connecting buildings between this and the side wings. About this time the German master Schlüter was engaged on the principal facade (page 194), whose influence is recognized in the rich sculptured ornament. (Fig. 201). The design for the garden facade was evidently due to M. D. Pöppelmann, the court architect of August-

Augustus the Strong (page 174). The interior was decorated in the Italian or German Barocco forms represented by the leading and executing artists.

Likewise into RUSSIA the Barocco style found admission. Peter the Great (1689-1725), after the precedent of the princes of western Europe, also desired to have an imperial palace corresponding to his luxurious court, to the splendor of the throne of an emperor of all Russia. He founded S. Petersburg in 1703, and prepared a fostering place in the now existing capital of western culture and art, for which he had obtained a special preference in his journeys through Germany, Holland and England. In the year 1715, he commenced the chateau of Peterhof, after the plans of the French architect Jean Paul Alexandre Leblond (page 75), which was subdivided by a colossal Ionic order comprising the ground and upper stories, and was surrounded by a grand garden design. Later he added to the chateau several other structures. The empress Anna after 1732 had erected the widely extended Winter palace, richly subdivided by projections and columns, that was only completed thirty years later, under the reign of the empress Catherine II. In 1837 it burned in great part, and was then rebuilt. As workmen were employed in S. Petersburg Italians, French and Germans. Among the Italians were especially prominent the two Carlo Rastrellis, father (died 1744) and son (died 1771), as architects of the Winter palace and of the Smolnoy monastery near S. Petersburg. (Fig. 202). For the church of this monastery (after 1738) the master allowed himself to be guided by Russian influences, when he permitted for the massive two story substructure, treated in a manner entirely unusual for Italian views, a lofty dome with lantern to rise, adjoined by four diagonally placed slender towers crowned by bulbous domes. The younger Rastrelli was also the architect of the great imperial palace of Zarskoe-Selo, whose external architecture is (Fig. 203) similar to that of the Winter palace, while the interior exhibits early Rococo forms like that. Likewise in Moscow and in other important Russian cities the inherited Byzantine-Russian architectural style could no longer oppose the form series penetrating from the west in an ever widening stream.

How mightily the Barocco forms developed in the countries of western Europe also pressed forward into the eastern may be seen, since even the mosques originating in the 18th century in Constantinople were unable to entirely escape its influence.

From Europe the Barocco style was carried to AMERICA by the colonial activity of the western countries. Soon after the founding of the Spanish colonies in Mexico and South America, architects settled there at the command of, or favored by monarchs greatly interested in the prosperity of their new possessions, laid out cities and erected in them churches, monasteries and government buildings, in which they followed nearly all changes in the architecture of their native countries. Already after 1573 Francisco Becerra had built a great number of church structures, among them being the cathedrals of the episcopal cities of Lima and Cuzco in Peru, that of Los Angeles in California and the Dominican churches in Mexico. On the broad facades with the stately flanking towers appears the style of the elder Herrera (volume 2, page 243) and later the capricious Churriguerism. (Page 44). The principal work of Spanish-American architecture is the cathedral of Mexico, begun in 1573 but only completed in 1791. It is a grand five aisled basilican plan with high transverse aisle, a low dome on a short drum over the crossing, and a massive facade with two towers, on which the massive effect of the solid lower stories of the towers and side aisles animated by few windows, upon the general appearance is counterbalanced by the extremely rich treatment of the recessed portals and the superstructures of the towers.

Of North America, the domains open to colonization north of the Spanish-Mexican possessions, during the first half of the 17th century were in great part under British, but also in part under Dutch and French sovereignty. In the year 1667 Holland was compelled to surrender its territory to England, and later after several wars carried on with the French, their domain also came into English possession. (1763). Therefore aside from some remaining works of the Dutch and the French periods, the architecture of North America entirely exhibits the style of English Palladian art. By the strongly churchly character of the new English colonies compelled by the rule of

Puritanism, the centre of gravity of architectural activity lay in church architecture. From the 18 th century ~~has~~ remained a great number of churches, that permit the influence of the school of Wren (page 204) to be recognized. The church of S. Michael at Charleston (about 1750) appears as directly influenced in plan and structure by the London church of S. Martin-in-the-Fields (page 214). The same stamp is borne by the somewhat later church of S. Paul in New York. Likewise a transplanting of British architecture to the soil of the colonies is shown by a series of stately country mansions, both in ground plan as well as in elevation and internal treatment.

237 II. ARCHITECTURE OF THE NEO-CLASSICISM.

General Basis.

In the Rococo the form series derived from the Renaissance had been carried to its extremest consequences. To the immense expenditure of power naturally succeeded relaxation and repose. The style of decoration of the extremely refined courtly style must lead to satiation with this luxuriant, affected art, degenerated into frivolity like the society of the time, in the sequence of which gradually became unavoidable a demand for simpler and stronger forms, a return from the trifling life dominated by deception and show to truth and nature. Even the art of the people had lost all restraint by the misunderstood and unskilful imitation of the courtly style of architecture, particularly by the thoughtless transfer of the Rococo decoration intended for internal architecture to the facades, and produced unnatural works in stucco forms diverted to stone, which must have called forth the strongest opposition from the independent artists. Thus already in the second quarter of the 18th century, especially among the artists sprung from the people, there set in a movement directed against the luxurious style of the residences of the princes, that first impelled toward quieter forms and to a return to the conception of the early Barocco, and then ever more decidedly to take up Classicism again. *

**"Classicism" is derived from the Latin "Classici", the designation introduced in ancient Rome for the first wealthy class; after the 2nd century A. D. employed for authors of the first rank, and in the Renaissance for the literature and art of the Greeks and Romans, held as models by the understanding of that time. In the modern period by Classicism is generally understood the adherence to the classic, i.e., to the scientifically investigated form series of Grecian and Roman antiquity, directly taken as a model.*

These standards were not even entirely lost in the period of the Barocco and of the Rococo. Just in France, the native land of the Rococo, in the sense in which it was adopted and developed by Palladio in his time, Classicism had always continued in use, and was always taken as a comparison and scale,

when great architectural projects were under consideration. (Page 69). Repeatedly among the learned were earnest discussions, as to the manner in which the great principles derived from the antique were to be taken now as fixed standards, and whether the modern architects could excel them. If one examines the written words of the French architects of the first half of the 18th century, he will thus obtain the impression, that the classical principles of form must have been taken as a basis for their entire activity. But in that time these only guided in the treatment of the facade; in the interior decoration was cherished the most unrestrained Rococo. Thus in their artistic opinions became strikingly apparent two tendencies far divergent by nature, and so it was no wonder, that the one aiming at the antique gained in the same proportion as the other lost its force.

The departure from the Rococo was accelerated in France during the reign of Louis XV by internal conditions and by the miserable results of external politics. By the continued and worthless change of the life of the king, by the lack of economy and the extravagance in the state finances, the ruined condition of the nobility and of the officials, and particularly by the unfortunate results of the wars (wars of the Polish and Austrian successions and the seven years' war), the importance of the royal court, the power of the state and the aristocracy had sunk most deeply. The representatives of the people depressed by the powerful king Louis XIV commenced to resist the subjection and the continual pressure of new taxes, and to think of their rights. The people drew comparisons with the internal conditions of England, where the Parliament had made great acquisitions in regard to its position as the government of the kingdom, and also with those of the free state of the Netherlands, that enjoyed a purely democratic government. Men looked upward to the development of human rights, and then appeared the antique in a magnificent light, to which already for a long time the new science and literature had referred in inspired descriptions. The increasing interest in former Roman and Grecian antiquity strengthened the tendency toward the conditions of that period, and against the luxurious and

over-excited style of the princes' residences, in which the people saw merely a reflection of aimlessness and the passions of the court life of the princes and of the great of that time, against those places on which the taxes wrung from the people were squandered beyond measure. From the people, in which had been preserved the best intellectual and habitual powers, came the reaction against the existing, against the art of the court.

But even the ruling class could not evade its influence. Literature had gradually taken a classical direction. The theatre, to which the then important world assigned high importance, required for the representation of the classical drama suitable surroundings, more spacious interiors, grand forms suited to the purpose of the play, such as the scrolled Rococo was unable to present. The views of antique columnar streets, columnar gateways and porticos represented in the theatres received the most animated approval; they substantially influenced the change of taste in art.

290 At the end of the movement already strong against the Rococo for forty years, an event at last came to its assistance, that was of the highest interest to the entire cultured world, the discovery of Pompeii in the year 1748. Already in the year 1711 had Herculaneum been discovered. Yet whatever was brought to light from the greatly ruined city extended but slightly beyond the frontiers of Italy. But the intelligence of the discovery of an antique city south of Vesuvius passed over the entire earth and occupied in great measure the interest of the learned. With real enthusiasm the statements of the finds made in the excavations were followed; numerous scientific explanations and investigations indicated the high importance of the antique and its infinite superiority over the art entirely degenerated into hollow phrases and scrolls. For artists and men learned in the arts the classical soil of antiquity again formed the aim of their longing. From nearly all lands men made pilgrimages to Rome and the Vesuvian cities, and also eastward to Greece and to the ruins of Hellenistic art in Syria. The different works on ancient monuments then published produced an extraordinary extension of the horizon. Of the French publications, that of Caylus, Recueil d'Antiquites (1752-1767),

and of the Italian, Piranesi's works on Roman ruins (*Vedute di Roma*) 1748, and "*Le Antichita Romane*", 1756, stand in the foreground. England, the home of northern Classicism, had preceded in the literary presentation of antique materials. Already in 1750 were published Dawkins & Wood's "*Illustrations of Palmyra and of Baalbec*", after 1757 Adam and Glerisseau's drawings of the Palace of Diocletian at Spalato, and from 1762 Stuart & Revett's great work on the Antiquities of Athens. Particularly the latter exerted a deep influence, not only on English art but on that of all Europe. In Germany, where learned research and philosophy very early found zealous culture, appeared a chief representative of the classical tendency in the acute and learned Jon. Joach. Winkelmann (born 1717 at Stendal; died 1768 at Trieste), the founder of the history of art and of archaeology. In the year 1754 he crossed the Alps for a permanent residence in Rome; in 1763 he obtained there the high position of a chief superintendent of all antiquities. Already in 1755 had appeared in Dresden his "*Gedenken*" (Thoughts on the Imitation of Grecian Works), received with enthusiasm; in 1764 was published there his fundamental principal work, arousing attention, the "*Geschichte der Kunst der Altertums*" (History of the Art of Antiquity). He treated in it the art of the ancients, less in the sense of antiquarian research, than in the experience of its esthetic harmony, and therein he gave a clear and exhaustive expression to the longings of his time. Two years later Lessing published his "*Laocöon*", which with the deep influence, that Lessing exerted on the entire evolution of German intellectual life, gave to the endeavors of the classicists the most powerful impulse. Meanwhile in France, Rousseau, by his path-breaking requirements written in a charming style (in 1750 appeared his "*Discours sur les Arts*"), had opened the contest against the degenerated civilization and for the return to nature, thereby incalculably influencing the spirit of the time.

The centre of the new art movement was and remained Rome, from which Winkelmann in connection with artists of like aims pointed out new paths, not only in architecture, but also in painting and sculpture. But in France those events occurred,

that with elemental weight produced the complete breach with the past and by their consequences shook the entire West, those of the French revolution. This originated disturbing transformations, not only in politics and in the social conditions, but in all domains of intellectual life. Also in art the previously decisive influence of the court and the nobility as well as that of the church was suppressed, and which was opposed by the state, partly governed by the people, the cities, the rich merchants and manufacturers, as well as the public in the great cities. With the French revolution appeared a new period.

It was indeed a result of the ideas spread over the entire West, of the equality and brotherhood of nations, that men regarded art as international, as something common and generally intelligible to all nations. In common was the limitless glorification of antique art and antique life by means of the revolution; in common were also the sources from which cultured peoples drew their artistic impulses; also common to all were the scientific interest and the archaeological conception of art, in which men did not then seek the national. The aims were the same almost without exception; the closest adherence to the antique and wherever possible the direct transfer of its series of forms; it is no wonder, that after the political waves had become quiet, the Neo-Classicism came to uncontested supremacy, gradually becoming international and colorless, such as no art style preceding it ever was. We shall see in the following, that it exhibits diversities almost entirely in its preliminary stages, as these were required by the unlikeness of the bases given in the preceding art, by the nature of the sources utilized, and the training of the executing masters.

207 I. Architecture of Neo-Classicism in France.

The same artistic event, that founded the last stage of the wildest Rococo in France, became the starting point for the return of Classicism; the competition established in the year 1732 for obtaining plans for the facade of the church of S. Sulpice at Paris (pages 88, 98). For this Meissonier (page 100) had proposed a design, in which he followed his aimless art imagination, carrying the Barocco ideas to the extreme, and even transferring the ground principles of the Rococo to the facade, which had never yet been the case in French architecture, since this always restricted itself within severer limits. In direct opposition to Meissonier's design was that prepared by a young artist, trained in the Roman-Classistic school of Salvi (page 39), Giovanni Niccolo Servandoni (1695-1763). He terminated the church by a wide facade of two stories constructed above each other, each of which received an open columnar portico between two solid walls, and was crowned by a continuous unbroken and heavy cornice. Servandoni's project won the victory. It was the victory of the grand strength of the Roman school over the belittled, sprawling and ornamented nature of French Rococo architecture. The execution first began in 1742. In order to give the facade (Fig. 204) more of the appearance of a church, a tower was later added on each corner. With this work Servandoni entered the rank of the most respected architects. Further importance as an innovator in art he obtained by his theatre decorations, which carried his fame to nearly all the larger courts of Europe.

About the same time another French architect had attracted public attention to himself, Jacques Germain Soufflot (1709-1780), by his great hospital (Hotel Dieu) built at Lyons in 1737. Likewise in this was expressed a conception of art opposed to the Rococo. The facade is 735.2 ft. long with two and a half stories, only subdivided by a middle building and two slight projections at the ends, while the recessed portions over the rusticated ground story received simple window enclosures without eaves. Curved lines are avoided, excepting the round-arched windows in the ground story and the oval windows in the upper story of the end projections, and likewise all

all swelled scrolled and ornamental work. Only a festoon of bands or flowers above the windows of the upper story in the projections forms a dry ornamentation. Soufflot found this treatment of the facade so much approved in higher places, that he was later called as an instructor at the Royal Academy in Paris.

The two works mentioned above were in their time only detached phenomena in French art life. Otherwise on the one hand had been dominant until about the middle of the 18th century the style favored by the nobility and introduced by the regency, on the other the severe school originated by Blondel (page 69). But the examples given by Servandoni and Soufflot influenced the artist world in increasing measure. A new and grand architectural project became a test of strength between the two tendencies and by its consequences a milestone in the history of French architecture. King Louis XV, after the peace of Aix-la-Chapelle (1748) following the conclusion of the war of the Austrian succession, hit on the idea of having a monument to himself erected by the city of Paris. He had the architects of the Academy requested to prepare plans. The problem there presented was grander than the Louvre facade in its time, since the artists were nowise restricted by definite requirements, but had to make sketches entirely according to their own ideas. The submitted designs are preserved in copper engravings. From the consideration of the king for existing buildings and their occupants, none of these were executed. On the other hand the king chose a site located before the Tuilleries garden and belonging to himself, established a second competition, and directed the instructor at the Academy, Jacques Ange Gabriel (1699-1782), the son of the previously mentioned Jacques Jules Gabriel (page 102), to combine a new plan from the designs received. (1753). From his work originated the Place Louis XV, now termed the Place de la Concorde. The long facades (Fig. 205) permit the recognition of a strong imitation of Perrault's Louvre facade, whose principal motive is repeated, the colossal columnar order in the two upper stories. (Figs. 205, 31). The lower story is subdivided in round arcades on piers. The details exhibit a severe treatment; it was

fundamental and determinative for French-Classistic architecture. As an ornamental motive are employed only stiff festoons of leaves above the windows and cloth hangings under them and on the angle projections. Already it appears here that Classicism has won supremacy in the art of the court.

He found at the court powerful support and assistance in the Marquise de Pompadour (died 1764), so generally favored by the king, who busied herself with art. In the circles of the artists and the cultured, there labored in his favor the spirited and influential archaeologist, Count de Caylus (1692-1765; page 233). With acute views and unbiassed practical weighing of the value of the antique for the art and literature of the modern period, he had very greatly contributed to clearing up a art questions, and had won for France an importance, similar to that of Winkelmann for Germany. Nearly contemporary with the publication of the first volume of his collected works, the Jesuit father, Marc Antoine Laugier (1713-1769), appeared before the public with indeed subversive ideas in architectural treatment. * He required as the highest points of view suitability and artistic truth, and indicated nature itself as the only true and determining model. It affords in art and manner the best instruction, as for example it forms the tree trunk as a support. Laugier therefore rejected the rectangular pier and the pilaster, the pedestal, demanded free spacing and uniform diminution of columns, and indeed without entasis, corresponding to the trunk of the tree. He declared the use of arches over doorways and windows to be defective on account of the spandrels produced, and likewise the colossal order, since this received its importance from the single story. The Tuscan order created by the Romans Laugier held to be a transformation of the Doric, and the Comocsite column (volume 1, pages 108, 111) as a tasteless combination of the Ionic and Corinthian. The returns and the pediment on the longer sides and over the windows must be avoided. In the entire architecture extreme frugality in ornamental decorative work must be the ground principle. These were indeed at first merely "ideas". But they found acceptance in the circle of thoughts of architects and were carried further by them. The immediate result

was a more intelligent and practical conception of architecture, an endeavor for simplicity and clarity, so far as these were expressed in the antique works. Most architects sought the way to the antique at first in a return to the Classicism of the early art of Louis XIV or that of Palladio. Consequently the transition to severer forms of treatment in the facades was less abrupt, than in the internal art. Therein the Rococo was supplanted about 1755.

* *Marc Antoine Laugier: Essai sur l'Architecture. Paris. 1752.*

The STYLE OF LOUIS XV * * then set in and is an expression of taste accustomed to and refined by the elegant art of the Rococo, even if at first this be merely external, to replace which it adopts and utilizes the forms given by the antique and wondered at by the entire world, indeed in the still purely ornamental spirit of design of the time, indeed under the influence of the Rococo. Its strength lies in the internal art. There it chiefly denotes an overturning of the principles previously in force; therefore it attains to a quite one-sided adherence to the antique. To animated masses of decoration is opposed great "repose of feeling", to picturesque grouping an orderly appearance. As the first was carried out the separation of the ceiling and wall. In the great halls the walls were subdivided by pilasters, half columns, and even by detached columns with flat capitals and the corresponding cornices; in the smaller ones this was limited to accenting the enclosures of the doorways and the mantle, which sometimes projects like a frontispiece with the great mirror placed above it. The doorways (Fig. 208) have narrow architraves standing on low bases with ornamented panels as jambs, above being slightly projecting consoles, on which rests a horizontal lintel with a cap, over this being usually a figure relief or a round or elliptical termination with a sunken decorated and arched panel. The mantle was treated as a sort of small table with decorated frieze and slab on consoles. Over it was always placed a great mirror. (Figs. 207, 213). Between these chief pieces of the subdivision of the walls, their surfaces frequently received in rooms for assemblages niches with statues on pedestals, but otherwise a kind of parapet as a base, in the

portion above this being rectangular enclosures with thin bands, on whose corners were sometimes placed small square plates with rosettes. Elliptical medallions with reliefs and wrinkled bands or festoons of flowers were especially favored. The ceilings were again subdivided in geometrical figures, frequently with a large oval middle panel and with coffer-like panels in the spandrels of the arches. In ornaments, besides the antique ornamental members like egg, leaf and bead mouldings, flutes, pipes, rosettes, frets, wavy bands, palm leaves, acroterias, anthemion bands and the like, there are also the acanthus scrolls in a pattern and languid form, thinly and loosely applied, wreaths of flowers -- mostly stiff laurel branches -- rings and rosettes arranged beside each other as frieze ornaments and light draperies, suspended in curves between rosettes. The acanthus leaf received a peculiar outline, which recalls the elongated spoon-shaped forms on the Rococo capitals. Palm fronds and naturalistically treated branches of plants, particularly thin leaved laurel, rose, ivy and vine, cornucopias, urns and vases with fret-like broken ears, the lyre, tripod, architectural fragments, emblems of day and night, inverted torches, halos and similar motives appear in the panels treated after the manner of the ancient grotesques. (Fig. 214). With them are connected figure paintings, that preferably have as subjects antique ruins, the life of the farm in the grottos, Mythological subjects like Leda, Ganymede and the like, groups of cupids, trophies with antique shields and helmets, still life, as well as little loves, doves caressing each other, and Chinese accessories, scattered around without criticism. The cabinet work has metal fixtures so that these add structural importance. On the stoves, supports of all kinds, clocks, house utensils, bases of columns, fluted drums of columns and capitals are often employed to superfluity. (Fig. 229). In colors are preferred fine, delicate and light harmonies with silver. By the richness in symbolical meanings of the motives, the naive combination and the extraordinary perfection in detail, the decorations of the Louis XV style acquire a dignified and lovely earnestness with a peculiar charm. (Figs. 207, 213, 214).

* * The style named after Louis XVI does not exclusively fa-

fall within the reign of that king (1774-1793); it developed rather in the two last decades of the reign of Louis XV (1728-1774).

* Note to Fig. 208. The execution of this dining room in the chateau already mentioned on page 88, occurred in 1779-81 after a design of Belanger.

On the façades men adhered to the former general design and in general also to its proportions. For the plan strict symmetry was determinative. In the structure was a tendency to extend the proportions to slender forms. The columns and entablatures received careful treatment according to their position and treatment; the Tuscan order was preferred, and the Ionic capital was often hung with garlands. Projections were very modest; the cornices were designed with five members, often indeed with labored modesty. Instead of the pilasters frequently occurred wall strips, which were decorated by medallions and emblems. (Fig. 208). Hermes and caryatids disappeared. On preferred places the wall surfaces were occasionally adorned by fixed festoons. The portals received a monumental treatment chiefly by Tuscan columns. The enclosure was often omitted at the windows. On the other hand sunken relief slabs in rectangular or arched form for relieving doorways and windows were not willingly rejected. (Fig. 209). The attics were animated by columns and acroterias, the domes being developed more in height than width. In their place altar-like or stepped structures of square or round form frequently formed the termination.

The new style appeared in a series of buildings in Paris and the provinces. The most esteemed architects were Jacques Ange Gabriel, Jacques Germain Soufflot (page 235) and the younger Jacques Francois Bloncel (died 1774). Gabriel is the creator of the Place de la Concorde (page 236). He had charge of the rebuilding of the chateau of Compeigne, continued the works on the Louvre and on the palace at Versailles (Library of Louis XVI and Salon of queen Marie Antoinette), designed there (before 1770) the splendidly decorated theatre (Fig. 210), and erected in the little chateau the Little Trianon (1771-1778) a charming building, that exhibits in the exterior as well as in

the garden design also influences of the English Renaissance. (Fig. 211). After the death of his patron Louis XV, he fell into disfavor, since his works no longer corresponded to the requirements of the tastes of the court.

More in the tendency of the elder Blondel (page 69) worked J. F. Blondel the younger, an influential instructor in architecture. From 1740 he carried on an academy of architecture, where he represented a severe conception in the subdivisions, based on the antique, but a freer one in the style of decoration. In the year 1773 appeared his "Cours d'Architecture", later a much used manual on architecture. As a practical architect he was chiefly engaged in Metz, (Cathedral portal, bishop's palace and city hall), and in Strasburg (on Kleber Place). From Soufflot came the principal work of early French Classicism, the church of S. Genevieve, the present Pantheon (design prepared after 1757, executed in 1764-1781). The ground plan forms a Greek cross 275.6 ft. wide and 367.5 ft. long with four piers in the form of right-angled triangles placed around the central area as supports of the dome, and a narrow aisle of columns around them. The dome is constructed in three shells (first under Napoleon I) with the lantern attains a height of 272.3 ft. The interior is covered by low domes over the cross arms and by coffers in the aisles, and is kept in pure Roman Corinthian forms. The exterior (Fig. 212) is massively treated by the imposing portico and the colonnade around the drum, but otherwise is kept very simple. The external walls of the **cross** arms have no subdivision, aside from the nobly profiled cornice with the garland frieze beneath it. The architect evidently there counted on the effect of the enclosed wall surfaces in contrast to the open portico and the dome. By the grand and unified treatment of the interior and the dignified architecture, the Pantheon belongs to the most important works of postmediaeval architecture.

One of the most important secular buildings of this period was erected in 1771 by the greatly gifted Jacques Denis Antoine (1738-1801) in the Mint. The facade has a width of 27 axes, with two high lower and a low upper story, extends along the bank of the Seine and is only broken at the middle by a projec-

projection containing five axes, that on the rusticated ground story supports five Ionic detached columns with heavy cornice, crowning statues and attic. The recessed wings have rustication in the ground story, with windows in the principal story rising from a bold belt course, parapet balustrade and horizontal roof, at each third window (counted from the external angles or those of the projection) being a balcony, but otherwise without any vertical subdivision. The facade became a direct model for a series of other buildings, particularly for the Royal palace at Brussels (Fig. 259). As a theatre architect Victor Louis (1735-1807) came to high fame by his theatre erected at Bordeaux in 1773-1780. He arranged the audience room in a three-quarter circle, supported the galleries by columns and only separated the boxes by low division walls. This theatre remained a model design until late in the 19th century, especially for its convenient access and broad stairways.

The French revolution (1789), in its blind hatred of everything courtly, made an end of the style of Louis XVI, that had developed its charm, especially in the smaller rooms, and had gradually attained high gracefulness. (Figs. 213 and 214 exhibit decorations of the year 1788). The fate of this art was thus intimately connected with that of the king and of his unfortunate wife, Marie Antionette. The spirit of the revolution first of all turned against ornamental richness; to this was opposed the most extreme simplicity. Meanwhile art researches had opened further domains of the antique. The temples at Paestum in lower Italy and in Sicily were drawn and thoroughly studied. The Doric order of the temple at Paestum (volume 1, pages 79, 82) appeared as the most impressive. Its architecture rejected delicacy of the profiles, necessarily on account of the materials already employed in antiquity (poros and travertine), and it was regarded as a direct model. By solid wall masses, restriction of the architectural expedients, the use of strongly conventionalized architectural ornaments with the exclusion of natural forms in garlands and the like, men sought to attain to elevated grandeur. To produce the utmost effect possible, architectural forms entirely without ornament were then preferred in dry proportions, especially stumpy Dor-

Doric columns, partly without flutes or even with flutes only commenced at top and bottom (volume 1, page 65), and further plain friezes, caps and cornices of heavy slabs, windows without jambs, and round-arched lintels without mouldings. Only the principal entrance was characterized by a columnar porch, a portico, or by a columnar loggia over it, where perhaps a fret or some palmations were employed. The striving after simplicity went so far, that even the idea of the cube in its undivided form found adherents, even for monumental buildings of the most complete type. This heavy Dorism of the time after the revolution, the style of the Directory, had its most important representative in Charles Dewailly (de Wailly, 1739-1798), a colleague of Servandoni, in Jean Francois Chalgrin (1739-1811), a pupil of ~~the~~ same master, and in Claude Nicolas Ledoux (1736-1806), who was engaged both as architect as well as copper engraver and writer on art. With A. F. Peyre the Younger, Dewailly built the Odeon theatre at Paris, where he omitted even the pediment on its octastyle portico. The building was burned in 1799, but was again rebuilt by Chalgrin. Ledoux most consistently cherished this tendency. He was an enthusiastic admirer of the cubical ground form of buildings, undivided wall surfaces without ornament, windows without enclosures, massive ashlers and colossal columns. The guardhouses at the gates are examples of his heavy style, of which we mention here only the Barriere S. Martin of the year 1788.

Under Napoleon I French architecture took a grand and unified course. The powerful monarch had an expressed preference for monumental architectural works in the style of those of the Roman imperial period. The Pantheon and the long columnar facades of the antique temples received his particular approval; the triumphal arches and honorary columns at Rome appeared to him as impressive tokens of imperial power. He beheld the principal superiority of buildings in the monumental grandeur, in the solidity of the materials and the workmanship. Unpretentious as he was himself, he preferred to reject all rich artistic means, even if these related to assemblages. By appropriate construction and the use of materials and by the endeavor for simplicity, the architectural works acquired an earnest

character and a national basal tendency, and in spite of the slavish dependence upon the antique world of forms, under the sway of the French art spirit, devoted to dignified and refined treatment of details.

Neo-Classicism then matured into the EMPIRE STYLE, named after the empire of Napoleon. This had already been prepared for in the seventies of the 18th century in the works of certain masters, among whom may be counted the before mentioned architects, Bessay, Chalgrin, Ledoux and Peyre; but first under Napoleon it came into general use and unified development. Its innovations appear in the ground plans only in slight measure. In the princely chateaus and the houses of the well to do citizens, one would not miss the comfort developed during the preceding period. The arrangement of the rooms therefore remained the same on the whole. For churches, men regarded the peripteral temple of antiquity, the central structure of the Pantheon at Rome, and also in part the Early Christian basilica as direct models. The theatre took an important place in the age of improvement. The form of the audience room already chosen by Victor Louis (page 243), the three-quarter circle with galleries inserted above each other, was retained, but the plan was extended by the addition of a foyer (hall for promenade and conversation), and later frequently with a concert and ballroom in the plan. The buildings intended for the government, for justice, for educational institutions, for traffic etc., already on account of the diversity of the requirements in each special case, matured no definite or generally prevailing type of plan. As a rule, the ground plan was designed in accordance with the proposed architectural problem, and then the covering occurred in classic forms. The new methods of construction did not substantially affect the framework of the building, although the emperor followed the acquisitions of technique with great interest, particularly the introduction of iron as a structural material. Thus the character of the Empire style was substantially fixed by the treatment of the forms. In this return to the architecture of the ancients men did not stop with that of the Romans and Greeks, but in part went farther back to the art of the Etruscans and even of the

Egyptians, particularly to the latter after the appearance of the grandly planned work on the land of the Pharaohs ordered by him. A labored archaism dominated architectural creation. Men limited themselves to naked wall surfaces, arcades without ornament and entirely simple cornices and window enclosures. The preceding severe Dorism thus experienced a further simplification. But it did not long prevail. The inclination peculiar to the French toward a refined treatment of forms could not be permanently repressed. From the stage of extreme modesty architecture must also of itself again press forward to a richer development. Already since the appearance of the severe tendency, had beside it been maintained a freer tendency, originating with the younger Blondel (page 242), inclined to the acceptance of decorative ornamental work. This now won influence in increasing measure. But it was always the spirit of the antique, into which men entered and from which they wished to create.

In general the French architects did not as sharply distinguish between the Roman, Grecian and Hellenistic styles, as occurred in England and Germany; they rather adopted the forms, that appeared to them as suitable. Therein they stood nearer the Roman than the Grecian. Indeed some of them placed themselves in direct opposition to all endeavors, that did not directly proceed from Greece. These desired to produce a pure Neo-Greek style, and therefore certainly employed Grecian forms with the exclusion of all innovations, such as middle projections, balconies, balustrades and the like, with impressive reference to the strikingly sparing use of ornamental decorative work in Grecian architecture. Yet they lacked influence to succeed generally in their demands. Thus in the French architecture of the empire the Roman series of forms almost entirely formed the basis. But for the decoration, the Pompeian-Hellenistic art style chiefly became determinative, whose dignified repose and cheerful magnificence aroused the highest raptures of cultured circles. Also from the style of Louis XVI had been saved some motives.

For the treatment of facades on the particular memorial buildings, triumphal arches, for whose erection in glorification

of places made famous by his soldiers, the emperor always had an open hand, the antique originals almost entirely serving as direct models. On the churches appeared the porticos of columns, or with a richer treatment, the surrounding colonnade and the antique mode of subdivision of the wall. For the remaining public buildings and the houses, more reliance was placed on the details for obtaining the classical impression. Before the entrance portico or the portal was preferred a broad flight of steps after the model of the Roman temple. At its side walls were placed statues, candelabras, sphynxes, lions, vases and the like in severely antique forms. The main entrance was generally characterized by a portico, colonnade or loggia or a gallery. The windows received entirely simple enclosures, if these were not entirely rejected. Frequently the windows were also arranged in groups together with rectangular piers interposed between them, also sometimes with small columns, in this case chiefly for the subdivision of round-arched windows in an evident allusion to the Italian early Renaissance. Great favor was enjoyed by windows in the form of semicircles, where the arches without jambs rested directly on the window sill or on a continuous belt. For the elevations of the stories were no longer chosen the half columns and pilasters in the sequence usual in the Renaissance, but mostly only a single order, indeed chiefly the Doric, and this only for the middle projection or the middle portal. Frequently the entire subdivision of the wall was restricted to sunken panels between bands like wall strips. A certain force was always given to the principal cornice. It was frequently profiled as a crowning cornice with cantilevers or consoles and was unbroken, if possible. The steep roof suited to the northern climate must yield to the low or terraced covering of the antique. On chateaus, villas and the better houses, a small antique structure, termed a belvedere, was placed above the roof as a rule.

In the internal treatment, it was sought in secular as well as in church architecture to adapt as far as possible, the form treatment of classical antiquity to the structural requirements. The columns or pilasters with bases and cornices as subdivisions of walls or enclosures of doorways again appeared

in increased measure. (Figs. 215, 216). In the wall panels w were often inserted plaster reliefs. The floors received stone slabs or a mosaic covering; the horizontal ceilings or vaults were frequently constructed with coffers. The incrustations (facings) of the ancients were chiefly imitated in stucco. In the enclosures and the surface patterns the circle and semicircle appeared instead of the ellipse; besides the rectangle with or without angles cut off were also employed the regular figures, star-shaped forms and the like. For the smaller rooms, men chiefly decided for plastering with stretched fabrics, indeed with silks, where the means permitted, elsewhere for a covering with paper hangings, that now became common *, or the Pompeian wall and ceiling paintings were imitated (volume 1, 250 page 125). Since the colors were not harmonized together according to a subjective artistic feeling and with reference to the purpose, dimensions and lighting of the rooms, but more intelligently, and indeed frequently were not directly transferred from the originals, a variegated coloring appeared there, that must lack the refined harmony of the Pompeian decorations. Otherwise, since men wished to attain to the white or light yellow tone of Italian marble as nearly as possible, they thought best to be very reserved in the coloring. A pure or slightly broken white or very light blue, gray or green, almost always forms the ground tint, on which silver, dead gold, yellow ochre, Pompeian red and ivory black are pallied to accent the details.

** The manufacture of paperhangings dates from 1835, after paper in rolls appeared instead of the previously employed separate sheets. The machine for printing paperhangings was first invented in the year 1852.*

The ornament (Figs. 216, 217) chiefly employed the antique ornamental members, such as the egg and the leaf mouldings, a pearl bead, rosettes, frets, ogees, acanthus scrolls and laurel branches (volume 1, pages 78, 114). To these were also added lions' heads, griffins, geniiuses, cupids, with garlands of leaves and flowers wound around them, and which play with cornucopias and sacrificial utensils, caryatids, tritons, urns with fret-like broken ears, sphynxes, reversed and crossed tor-

torches, the Roman fasces * and other emblems, the latter chiefly in imitation of the Louis XVI style. On the other hand were avoided its naturalistic wreaths and garlands of flowers. Where foliage came into use it was strongly conventionalized in dry transparent garlands. The ornament was composed of reliefs, often cast in bronze on doors and furniture, or hammered from sheets of metal with sharp outlines on the surfaces.

* "*Fasces*" was the name of the bundle of rods bound together with a red band, with an axe in the middle, borne in Rome by the lictors, the servants of the ruler and of the highest officials in public assemblies, as tokens of their official authority.

The entire art of interior decoration allows the recognition of an assured feeling of style and a refined taste, that also appear in the understanding of the beauty of the materials.-- for the furniture were preferably employed mahogany and similar woods. (See the bronze door in Fig. 215). The smith's art, that reached such a high stage in the preceding epoch was therefore almost entirely lost.

At the fall of Napoleon the Empire style was completely developed and established. In the works of the most eminent architects of the emperor, Percier and Fontaine (page 253), it had rather turned toward the tendency of Neo-Hellenism, which was recognized particularly in the weak treatment of the architectural members, peculiar to Grecian-Hellenistic art, especially of the capitals, mouldings etc.; (Volume 1, page 39), with all the other strength in design. The ornamental treatment of the forms and refinement of all details corresponded to the French art spirit far more, than the heavy style of the preceding Dorism. The French Academy at Rome provided for the continuance of classical training of architects in the paths already laid out. Thus the Empire taste dominated artistic creations in French countries until about the middle of the 19th century.

Of the leading masters, the previously mentioned (page 245) J. F. Chalgrin further represents the severe Doric style. He won his artistic fame as the creator of the design and the fundamental architect of the Arc de l'Étoile, which Napoleon caused to be erected after 1806 in glorification of his campaigns, at the termination of the Grand Champs Élysées on an elevated

Place, at the vast scale of 147.6 ft. wide and 184.1 ft. high, surpassing all triumphal arches of the ancient world. (Fig. 218). The structure keeps itself entirely free from the influence of antique models. Its imposing effect is based upon the powerful architectural treatment by the impost belt, the mighty crowning cornice and attic, and as the sculptured ornamentation of the reliefs and the groups of figures 39.4 ft. n high, that are arranged on projecting pedestals at each side of the passage. The completion of the colossal structure, that at most strikingly characterizes the **Developed Empire** style, only followed in the year 1836. The military fame of Napoleon was likewise commemorated by the triumphal column erected in Place Vendome in 1806-1810 by Jacques Gondouin (1737-1818), a pupil of Blondel, and by Jean Baptiste Lepere (1761-1844), which appears as an imitation of the column of Trajan at Rome. (Volume 1, page 123).

About the same time the emperor conceived the plan of erecting a new building on the **site** of the church of the Madeleain, torn down during the revolution. He desired to have a "temple", which should not be inferior to those of the Romans in magnitude and magnificence. Earthelemy Vignon (1762-1846) prepared a design for a peripteral temple of the Corinthian order with a double portico of columns and a broad flight of steps, which received the approval of the emperor, and that Vignon then executed at his command. (Fig. 219). Yet after the exile of Napoleon, this Temple of Fame was transformed into a church by the same architect, by means of the narrow vestibule, side chapels, a semicircular apse, and by the vaulting of the aisle with three low domes. Even though it may not produce by its most monumental and dignified architecture the impression of a House of God, still the architect attained in the interior an earnest and churchly effect, even with the antique series of forms. A stately appearance entirely similar to that of the Madeleine is that of the Bourse (exchange) erected in Paris after 1808 by Alexandre Theodore Brogniart (1739-1813), a pupil of Blondel. Without taking **further** account of the purpose of the interior of the two story structure, on it was employed again the Roman-Corinthian temple architecture directly after the model of the temple of Vespasian in Rome.

The architects just mentioned retained a certain severity in the pose of their buildings and the employment of decorative expedients, that lend to their works an earnest and solemn expression. So much the greater concessions were made to elegant richness by the two chief masters of the epoch, Charles Percier (1764-1838) and Pierre Fontaine (1762-1853). Both had studied in Rome at the same time, indeed not only the architecture of antiquity but also that of the Renaissance. Having returned to France, they sought to elevate the native internal and minor arts by the publication of designs in the classical sense. Their strength consisted chiefly in decoration and the treatment of details, in which Percier combined a rich art imagination and a refined taste. But Napoleon esteemed Charles Fontaine as the more important artist, evidently on account of his conception being more inclined to a more powerful treatment, and in 1813 appointed him as his first architect. Both artists chiefly worked together and exerted a deep influence on their contemporaries and on the entire French art of the first half of the 19th century.

The first large commission was received by Percier and Fontaine about 1800 in the building of the chateau of Malmaison, afterwards the favorite residence of Napoleon and of his first wife Josephine. From 1805 onward, they were principally engaged in works on the imperial chateaus, among which the extension of the Louvre formed their chief problem. There they erected the wing connecting the two pavilions of Marsan and of Bonaparte (ground plan in volume 2, Fig. 301). The facades exhibit, with frequent approximations to the late French Renaissance, an extremely well treated subdivision, entirely designed in the sense of the Neo-Classicism. Figs 215 and 216 afford a view of the internal architecture. * A further work of the two architects we have further to mention, the triumphal arch erected in 1806 on the Place du Carrousel, an almost faithful imitation of the Arch of Septimius Severus at Rome (volume 1, page 138), and the Expiatory chapel built (1820-1826) as a tomb chapel for the royal pair, Louis XVI and Marie Antoinette, who fell a sacrifice to the revolution. This received the ground form of the Greek cross with three semicircular apses, portico and dome in the noblest proportions and treatment, and with a

sober but extremely finely designed ornamentation.

* *The execution of the portico of the building represented in Fig. 215 followed under Napoleon I, the hall shown in Fig. 216 under Charles X (in the year 1827).*

Among the pupils of Percier, Hyppolyte Lebas (1782-1867) and Jacob Ignaz Hittorf (1792-1867) from Cologne on the Rhine, are the most important. The former built the church of Notre Dame de Lorette (1823-1836) after the type of the Early Christian basilica with a tetrastyle corinthian portico in very severe **forms**, but with rich Hellenistic decoration. Hittorf assumed a **far** higher standpoint. He had thoroughly studied in 1822-1824 the Italian and Sicilian architectural works of antiquity, demonstrated their polychromy, and had thoroughly corrected by his publications on Grecian temples of lower Italy and Sicily the former opinions of the lack of color on antique architectural works. Then the long repressed enjoyment of colors again appeared in the foreground, both in the selection of the materials as well as in the mode of decoration. Hittorf first employed on his church of S. Vincent de Paul, begun in 1842 and completed in 1884. For the ground plan he retained in general the design of his father-in-law Lepere as a five aisled basilica with an apse occupying the entire width, but **not** projecting externally, with galleries, two facade towers and a hexastyle portico. With all its firm adherence to severe classical forms, the interior, by the colored stone materials and the polychrome decoration, acquired a substantially different effect from before. It received the lively approval of contemporaries. The facade itself (Fig. 220) is still entirely classical in the entire pose and particularly by the noble Ionic portico. But in pilaster architecture, the treatment of the cornices, the balustrade over the middle portion and the flight of steps is already manifested the spirit of the Neo-Renaissance, then penetrating into French architecture.

2. Architecture of Neo-Classicism in England.

In England occurred in the second half of the 18th century a period of advancement in the entire public and intellectual life. While the continental powers exhausted their best resources in the seven years' war, England made its immeasurable colonial conquests. Great wealth flowed into the mother country, where it greatly contributed to the promotion of travel, industry and commerce, and also to further all intellectual and artistic interests. At the end of the century in contrast to France, shaken by its great transformations, to Germany powerless in its internal divisions, and to Italy in entire dissolution, England acquired a highly valued position, as a world power. But it did not restrict itself to the political domain. Owing to the intellectual activity of its people, richly developed under favoring conditions, and its aims directed to distant and great things, England likewise had taken the lead in all western intellectual life, and particularly in the investigation of antiquity, among Europeans learned men, artists and men devoted to art knowledge. With the same energy, with which Palladio's teachings had been adopted, men now turned to classicistic ideas.

The English Neo-Classicism had no Rococo as a direct predecessor. From the days of Inigo Jones (volume 2, page 232) English architecture had remained within the character of Palladian classicism. The movement appearing about the middle of the 18th century in the cultured world for the revival of the antique therefore did not lead in the island realm to a complete breach with the past; it also produced no transition style from the art of decoration in the style of Louis XVI, that changed the Rococo to the Neo-Classicism; it frequently strengthened the previously existing ground principles, made the eye more acute to the purity of forms and favored the development of a severe tendency toward archaeology, which in the restless subordination under the formative principles of the ancients, saw the climax of artistic perception.

Certainly also in England already before the middle of the 18th century undercurrents had set in toward the classicistic conception of art. These pursued other aims than on the cont-

continent. Already in the 17th century, and thus much earlier than in France and in Germany, men in England had interested themselves in mediaeval architecture as art knowledge, and had published grandly planned works with drawings of mediaeval buildings. * Wren, the principal master of the late English Renaissance, even if unwillingly and only at the desire of his employer, had already erected Gothic buildings (page 201, 206), and other architects had followed his example. These were indeed limited to a few examples. These earliest attempts for a revival of the Gothic art style could not occur in opposition to the strongly increasing classicistic movement of about 1750. But they had an effect on this, since they were precursors of a deviation from the classical ideal of art and a separation of aims, and constantly contributed to a certain uncertainty among the architects, who by the authoritative use of the antique, elevated above all doubt, sought a so much closer adherence to the classical models.

* *Doasworth and Bugdale. Monasticum Anglicum. After 1655.*

Under these circumstances, the circles of architects as well as those of the cultured and art-loving public, the publications on the architecture of antiquity (page 233) appearing at that time but previously mentioned, were received with great interest. Special consideration was found by the grandly planned work of Stuart and Revett. It gave a most powerful impulse, that the eye should again be directed to the architectural creations of the Greeks. men drew comparisons between Palladian and Grecian art. This was soon recognized as more elevated; on it was based criticism. 'The Palladian ideal of form was replaced by the Hellenistic.

The English Neo-Classicism began earlier than on the continent with a severe Dorism. The way to this was found indeed through Palladio and the Roman antique. In the works of the leading master of the beginning Neo-Classicism, of Sir William Chambers (1727-1796), born in Sweden, but brought up in England and educated under Clerisseau in Rome in 1750-1755, the unity of style was not yet consistently expressed. Chambers employed forms of the Roman antique, as well as those of the Italian and even of the French Renaissance. He also occasionally resorted to Gothic, and even though only in a decorative s

sense, to oriental and particularly to Chinese architectural motives, with which he had become acquainted during his stay in China. He held himself averse to Hellenism. His colossal facade of the great official palace, Somerset House in London (1776-1786), with the rusticated substructure, the Corinthian pilasters and three-quarter columns in the upper story and the massive principal cornice still entirely has the basal tendency of a correct Palladianism. (Fig. 221).

The entire abandonment of the Palladian series of forms was earliest completed in the works of the brothers Robert (1728-1792) and James Adam (died 1794), the sons of the previously mentioned William Adam (page 213). The refinement of the internal architecture, as chiefly developed in France, received increased attention as a result, for which the Palladian architectural style, chiefly employed for the external architecture, was no longer satisfactory. The two brothers Adam then introduced into interior decoration an extremely graceful and ornamental style, which was essentially based on the Hellenistic series of forms, but also shows many things allied to the style of Louis XVI. They published their designs (Fig. 222), in which the influence of Piranesi is undeniable, and exercised an architectural activity far exceeding all other architects of their time, whose centre of gravity lay chiefly in the erection of great city mansions. To them were given extremely tasteful ground plans, that are still models. In external architecture certainly occurred a weakening in them, that is especially striking, when one compares their works with those of their great predecessor Wren. They sought there by severity and dignified pose to produce an impression, chose simple Doric columns and piers, semicircular windows in the lower story and pediment, elsewhere rectangular windows with caps or round arches in a simple enclosure, also frequently grouped windows beneath an architrave and plain friezes and cornices in very modest profiles. (Fig. 223). The country chateau of Kedleston Hall in Derbyshire is not only in the ground plan but also in the structure, particularly in the portico above the flight of steps, is not inferior to imitations of Palladio; but the domed room is evidently influenced by the Pantheon. The facade

of the University at Edinburgh erected in 1789, exhibits an earnest character by the grand and quiet proportions. The facade rising in two and a half stories above a high rusticated base is subdivided by an elevated middle and two side projections, each of which has three axes as well as the recessed parts. The entrance opens between Doric columns and is flanked on each side by two projecting columns, that support the balcony. Aside from a stiff garland of flowers in the attic of the middle projection, there is no ornamental decoration. A great number of buildings in London still exhibit remains of the already strong Hellenistic style of the two Adams.

257 Their successors lacked the special creative power and independence opposed to the ever increasing book knowledge in architectural creation. The opinion, that the antique works under all circumstances must be taken as the most perfect creations of architecture, and that individual works should be esteemed the higher, the more closely they came to the antique ideal, was carried so far, that not only details of antique buildings were directly copied, but wherever possible, precedents of all forms employed were sought in antiquity. The structural organism itself was ever more neglected. Sometimes inconceivable imitations of famous monuments were placed beside and above each other. The enjoyment of classical forms controlled everything. Finally even the simplest citizen's house and gate lodge received a Doric portico and an accompanying cornice.

About the end of the 18 th century Sir John Soane (1752-1835) was the most esteemed architect. He belonged to the theorists, after long studies in Holland and Italy had written a work on temples and designs for baths (1778), later publishing designs for houses (1788). His most important work is the Bank of England in London, planned with great dimensions. On it he furnished the street facades with sham doorways and false windows, which should have been solid for security, whenever possible; he subdivided the fronts by an order of Corinthian columns and pilasters. Thus he employed the means of expression for the most open treatment of the structure, where its purpose required the contrary. The treatment of the forms is that of the Roman antique; in the architecture of the court, Soane reverts

directly to the Roman designs of baths.

The later masters were professed Hellenists. William Inwood (1771-1843) was made famous by his church of S. Pancras in London (1818-1822). It has the plan of a hall church with galleries, before whose facade for its entire width is placed a portico directly after the model of the Erechtheion. Behind it rises a tower in three stories, on which are repeated the treatment of the Monument of Lysicrates and that of the Tower of Winds at Athens (volume 1, pages 87, 93, 95). Inwood arranged a sacristy at each side, on which he copied the details of the Caryatid portico (volume 1, page 88). Just as if also compiled appears the internal architecture with the massive columns in the choir, the slender columns in the galleries and the heavy coffered ceiling. But the church of S. Pancras aroused wonder and found imitation, a proof that in considering architectural works, the eye had become chiefly directed toward the detail forms, the columns and capitals, friezes, coffers and the like, remaining on these with an almost entire lack of any criticism of the structural organism itself, and a reasonable choice of architectural expedients according to the requirements of the particular architectural problem. Where this finally led is most strikingly shown by the country mansion of Grange in Hampshire, built by William Wilkins (1778-1839) in 1820. There the plan of a dwelling was compressed into a T-form, whose architecture in no wise expresses the purpose of the building. (Fig. 224). The complete subordination of the requirements of the arrangement of the rooms to the purely superficial enjoyment of the architectural members of antiquity, appears on this structure exactly in a similar way. Wilkins had better fortune in the rich development of Corinthian columnar architecture on the National Gallery in London, two stories high and very much elongated, and in the similarly treated University there, although there the harmony of the whole was entirely lost.

John Nash (1752-1835) disposed more freely of the form apparatus of the antique. He carried on a great activity, chiefly following classical paths, but partly also in the mediaeval sense. He greatly influenced the architectural appearance of

entire quarters of the city of London (plan of Regent street, of the Regent's park with the adjacent groups of houses, the row of houses at Carlton House terrace etc.), and frequently adhered to the architectural style of the Adam brothers. As his chief work must be taken the garden facade of Buckingham palace, erected for George IV in 1825-1837, whose projecting Hellenistic-Doric columns of the height of the ground story support a continuous balcony, while in the upper story only the middle projection exhibits a Corinthian order of pilasters extending through one and a half stories. The creations of N Nash do not lack grand lines but internal truth. In order to secure the most impressive architectural appearance possible, he combined a great number of small and medium separate houses (sometimes 20 to 30) into a whole, that he treated like a palace on the middle and side projections, while the recessed portions remained simple. Thus he gave an example, which soon found imitation in Edinburgh and other cities. The stucco facades painted in oil colors were introduced into England by him in place of the former brick facings, and facilitated this architectural style, but became fatal to it. The owners of the separate houses would not yield the right of deciding on the color of his property. Soon the colossal facades were composed of variegated and distinct strips, and not seldom one portion of the projection was red, another part being green or blue, which had an extremely disturbing effect, especially when the vertical division passed through a column. Thus the deception is abruptly manifest, when these buildings appear as palaces.

The English Neo-Classicism was perfected in the works of Baseir, Elmes, Cockerell and Smirke. George Baseir (1795-1845) was the builder of the Fitzwilliam Museum at Cambridge, whose dignified show facade between narrow end projections, treated more like antes, opens in a noble Corinthian colonnade with octastyle middle projection. That L. Elmes (1814-1847) unfortunately died too early, but commenced the great St. George's Hall in Liverpool, which is to be regarded as the most important creation of Hellenism on English soil. The building is 590.6 ft. long and contains a great festal hall, two smaller halls and other rooms for public sittings of the courts of jus-

justice. It rises in a terrace accessible by a wide flight of steps in a majestic structure, and with a clear treatment by a colossal Corinthian order with sixteen columns in the middle projection of the main façade, an octastyle portico at one end, and with rectangular Corinthian pilasters in the recessed parts with the corresponding entablature and attic. The internal architecture (Fig. 225) was completed after 1847 by Charles R. Robert Cockerell (1768-1863) with a somewhat freer employment of Grecian forms. Cockerell was from 1810 to 1817 in Italy and Greece, where he made excavations at the temple of Athene on Egina (volume 1, page 80) and at the temple of Apollo in Phigalia, whose results he published. His well proportioned Hanover chapel in London (1823-1825) recalls in the design of the façade with two towers the noble columnar portico of S. Vincent de Paul in Paris (Fig. 200). The last representative of pure Hellenism was Sir Robert Smirke (1780-1867), Soane's most important pupil. After returning from his journey made in 1801-1805 through the civilized countries of Europe, he built (after 1809) the stately Covent Garden theatre in London (Fig. 226). Then for the dignified housing of the art treasures of the British Museum, greatly increased during the recent period, a new building appeared necessary, and Smirke was entrusted with its erection (1823). He devoted his chief attention to the Ionic portico, designed at a great scale, that he built before the building, 374.0 ft. long in a middle colonnade and two wings. In consequence of the immense cost required by the construction, its completion according to the design was not approved. After the façade was finished (1845), Smirke was compelled to give up the continuation of the portico along the sides. Today the colossal columnar façade (Fig. 227) appears as a purely ornamental stage scene, only intended to hinder the access of light to the rooms behind it, that certainly require more abundant lighting.

Thus it must dawn in the perception of the most zealous veneration of the antique temple style, in consequence of the experiments made with its structures, that the art and mode in which the forms of the antique were transferred as in England, thus being purely copied, cannot be brought into harmony with

sound sense in architecture. The classicists by their works had finally brought out the strongest opposition and frequently the scorn and derision of their opponents, and by their transgressions had contributed not a little, that the movement in favor of a revival of mediaeval art constantly won more adherents. By a closer examination of the attempts made by them, recognition cannot fail, that the classical architecture of antiquity could only be employed for the new architectural problems in a transformation suited to the time, about as the Romans adopted it. The contest of the purposes ever proceeded further to the injury of the Hellenists: it was really already decided by the establishment of the architectural works of the colonnades of the British Museum. Thenceforth (1845) English architecture stood entirely in the paths of the Neo-Romantic and of the Neo-Renaissance.

3. Architecture of Neo-Classicism in Germany and Austria-Hungary.

Germany already about the middle of the 18th century had been under a predominating foreign influence. This likewise continued during the entire second half of the century, since under the complete religious and political division of the people, with the lack of an economical and intellectual centre and of artists, who could have undertaken the guidance of the nation, the requisites for a strong and unified independent development of German art life were not given. The movement against the Rococo, penetrating from France, also found energetic adherents in Germany already in the fifties. Winkelmann (page 233) had in 1755 indicated the necessity of a reform in architecture by his "Gedenken über die Nachahmung der griechischen Werke". (Thoughts on the Imitation of Grecian Works). The acute Lessing, so strongly influencing the spirit of the time, supported him in a peculiarly effective way in his "Laokoon". By his translations, Voss brought the Homeric epics to the German people. Later Schiffler and Goethe also appeared in the ranks of the venerated of classical antiquity. Antique materials gradually dominated the literature and the entire thought. It was thus unavoidable, that the form world of the antique was soon esteemed the highest ideal for architectural creations as well.

But their adoption in Germany at first only resulted from a purely superficial enjoyment of antique treatment and ornamental forms. While the French and English under the influences of the preceding severe school found the way to the antique in a return to their earlier art, which gave it support, unity and a national stamp, the German masters could not adopt the native Renaissance, so far removed from the "true antique", for the embodiment of the new ideal (volume 2, page 266 et seq.). They must look around for other sources; these were offered in the works of Piranesi (page 233), that had aroused great attention also in Germany. Piranesi saw and drew the monuments of the ancient Romans with an assured intelligence, unusual for his time, and with a refined artistic eye. But he collected substantially only ruins and architectural fragments of every kind, and these chiefly in a picturesque conception, in their

ruinous construction and coursing indeed **fanciful**. His representations attract attention to the charm of the architectural and ornamental treatment of the details in their contrast to the ruinous condition of the structures themselves and their appearance in the fileds of ruins. By these views the German masters came to know the architectural members, not in their combinations, their relations to the whole, but only in the details. They filled their imaginations with these, and compared with them a new ornamental work. Already after the beginning of the sixties, orders of columns and pilasters, separate bases, drums of columns, capitals, flutes with cables, urns, oval medallions, frets and cornucopias, garlands and wreaths of stiff leaves had found admission into the internal arrangements of chateaus and churches, as well as into the house utensils of the better rooms of the citizens. Likewise in the facades, they gradually appeared, though in uncertain attempts and frequently mixed with motives from a weakened Barocco style. (Fig. 228). Thus was formed the Pedantic (Zopf = pigtail) style, * which is a parallel to the French style of Louis XVI, and chiefly differs from that by the naive combination of the new ornamental forms and by the retention of many Barocco motives, particularly in the lines of the caps, enclosures and the like. (Figs. 229, 230).

* The name of "Pedantic style" (Zopfstil) originally related to the art of the periwig period, thus to a time, in which the custom was ordered by king Friedrich Wilhelm I of Prussia, also introduced by him into his army in 1713, prevailing in Germany during the entire 18 th century, that also the men, like the king, should either wear a natural or artificial pigtail (queue). In this respect the term "Pedantic style" would also included the Rococo. But with a more acute separation and indeed in more recent times, it generally only refers to the style of architecture developed in the second half of the 18 th century in the reaction against the Rococo, that by a return to tasteless simplicity sought an accession to the antique.

The epoch of the early pedantic style ended at about the time, at which the French revolution also seized on the heads and minds of the people on this side of the Rhine. The bound-

boundless veneration of antique life brought by the ideas of the revolution then led to a complete breach with the influences of the Rococo and to an intensive study of antique art. Men were more severe in scientific conceptions in Germany than in France; they went directly to Greece as the purest source and the most perfect model of artistic creation. Then the heavy and earnest forms of the early period, as presented at Paestum and in Sicily, were soon more highly esteemed, than the more refined and mature style of the buildings on the Acropolis. Even the Egyptian art style was consulted, after it had become known in the West through Napoleon's great publication. (Page 247). The eye was then no longer directed to the details but to the entirety. Men desired to produce effect by weight and monumental dimensions. Great restraint was placed on the architectural subdivisions. The wall surfaces should appear as such. Aside from purely monumental structures like gateways, museums and the like, columns were held to be justifiable only on the portico, at the principal entrance, or also in a loggia over the entrance (Fig. 231), ornamental and relief decoration in severe Grecian drawing in any case as palm-atrium or figure frieze, on the semicircular or rectangular sunk panels over the windows, or as inset relief slabs, more rarely as statues on the portico or in the vestibule. After the style of the Corinthian atrium (volume 1, page 124), to this was given a dignified and important pose by detached Doric columns.

267 For the interior decoration fewer models existed from antiquity. Here reference was chiefly made to the works of Percier and Fontaine and of the Adam brothers (page 257). The internal decoration therefore also very closely approaches that of the Empire style. Since this was almost entirely taken directly for the interiors of chateaus, this almost wholly dominated the internal ornamentation on this side of the Rhine. In the inclination toward forms more in relief and to a bolder application of decorative forms was manifested the German art in design. About the end of the century grotesques (volume 1, page 114) found acceptance and abundant approval, and of which some examples had become known already by the books of Piranesi and

from other works, and which then German masters had thoroughly studied on antique buildings in Rome and Pompeii and in the V Vatican loggias (volume 2, page 190). They first appeared on the shafts of pilasters and the panels of doors, but increasingly pervaded the architectural members. Eight panelings, partly in relief in stucco and partly painted, appeared in their place. (Fig. 226). In the panels antique materials found acceptance, particularly paintings, that often deceptively imitated relief sculptures, but also views of landscapes with temples, ruins, statues, and also particularly Chinese gardens and pavilions, arched bridges and the like, in a conception, that recalls much in the fourth style of Pompeian decoration (volume 1, page 125).

In the art of the court and indeed in the apartments intended for assemblages and on facades, the great architectural expedients of the orders of columns and pilasters was not yet entirely rejected. So much the more consistent was the art of the citizens.

262 The German people were very strongly under the ban of the ideas on the generalization of human rights and of popular happiness by its tendency to thought, literature and dreaming. Since to the citizens was still forbidden any intellectual participation in the interests of the entire people by the measures of its princes, yet controlled by absolutistic views, these ideas survived in the world of thought. In this was formed the conception of freedom of the third estate from the petty restrictions of its government, of a citizenship of the world, which not only brought it near to the spirit of the Greeks and Romans, but also allowed it with almost entire forgetfulness of the frightful wounds inflicted upon it by its Gallic neighbor, in recognition of its superiority in the artistic domain, to take it into its own house and there to mature it. Men hesitated so much the less there, since they wondered at that people, that first on the continent broke its fetters and became a leader in the fight for the general and highest ideals of humanity. The example given by the French in the revolution exerted its overturning effect in Germany with the peaceful character of the people only in philosophy and literature. This

brought out in prose and poetry one revolutionary gush after another. It did not come to powerful and bloody revolution. To the irritating contests, which Germany had behind itself, succeeded a relaxation, a longing for repose. So much the more intimate was the participation of the people in the acquisitions of the German intellectual life, which introduced the classic age of literature in a wonderful development of the powers of Germans in the literary and philosophical realms. In the souls of the people and under the lead of the most brilliant minds of the nation originated an idealism, which in contrast to the influence of the court in the 18th century toward the civic virtues, beheld in manly greatness and the strong customs of the race the purest source of all perfection of human existence. But in it from the consciousness of a height in literature, attained by no other people, grew the young plant of a new national feeling. Its purpose at first was almost exclusively expressed in the purely literary domain; in art only so far as an increase of the tendency against the supremacy of the Rococo style, which men found like its supporters degenerate and demoralized. The contrast to this also appeared in the citizen's house, and perhaps even more strongly there, than in the great art of the public, in a reversal of all the principles on which was based the scrolled nature of the Rococo, and in the return to the most extreme simplicity.

Certainly the rejection of all richer artistic expenditure was also an unavoidable demand of the conditions of the time. The burdens of the war and of taxes had entirely exhausted the people, and the continental embargos had produced an economic depression, which required the greatest restraint and frugality. Men had become modest through all the misfortunes, modest to complete unpretentiousness.

Under the pressure of these conditions, from this frame of mind was chiefly developed that art style principally at home in the citizen's dwelling, which we present under the name of the "Biedermeier" (honest man's) style. It is the form of expression of a severe and yet spiritually rich time, sheltering itself from the rude external conditions in a beautiful intellectual life, which in a tasteless love for art with great mod-

modesty, accepted the simplest as the best, for the fulfilment of the needs of the habitation, paying the first attention to durability. Extremely unpretentious and only arranged for the most indispensable needs was the plan, infinitely simple and almost entirely reduced to the naked structural form was the elevation. The architectural elements of the antique made known by literature, the columns and pilasters with the cornices and pediments could only come into consideration for public buildings, particularly as porticos for churches, city halls and the like, and perhaps also in the vestibules of especially rich structures. Also these are chiefly the forms of a Doric reduced to the extreme limits with stumpy columns without flutes or pilasters with the correspondingly triglyph entablature. On dwellings the subdivision of the facade mostly consists only of the surface divisions by vertical and horizontal bands, by the arrangement of broad wall strips, that often extend through several stories, so that the windows lie in sunken panels. (Fig. 232). If men wished to go farther, the portal was then characterized by the simplest combination of columns or pilasters with frieze, cornice and pediment. Sometimes, even though more rarely, a balcony was arranged on consoles, which indeed appear as entirely plain stone slabs projecting from the wall in form of a half ellipse rounded off at the upper end. Over the windows were preferably placed sunken and usually semicircular relieving arches, occasionally adorned by ornamental work. Otherwise frets and palmatium bands, acroterias, rosettes, ornamental bands or a singular relief, let into the wall at a suitable height, formed a dry concession. (Fig. 233). Careful attention was always paid to severely symmetrical design and to a well considered proportion of the wall surfaces to the openings. (Fig. 231). Thereby these buildings received a higher approval. Wherever possible, evidently obeying an impulse coming from England, the better houses were set back from the street in a garden.

Of the internal treatment of the living room (Fig. 234), the working rooms of the intellectual heroes of Germany's classic time, and preserved in their original condition, give us a representation. The ceilings are tinted white, the walls white

or pale green, more rarely light blue or yellow, the floors sprinkled with white sand, so that the appearance of the floor approximates that of the ceiling. The stove is likewise white, architecturally treated and as a rule, is decorated by some ornament. On the wall terminated at top by a plain cornice, the mirror with narrow gilded frame, broad decorated frieze and a crowning band occupies a preferred position. Some copper engravings and family portraits in rectangular or round frames, black or varnished brown, surrounded by a great number of silhouettes of the members of the family and of its circle of friends (then a favorite and cheap substitute for the portrait in a drawing or lithograph), are distributed on the remaining wall surface in severe symmetrical regularity. Among the furniture is the glass cabinet in which the valuables and nicknacks are exhibited, is indeed the most important piece. A "secretary" like a cabinet, a part of whose front can be turned down as a writing desk, a chest of drawers, on which is a clock with alabaster columns and with cupids or emblems of day and night, of time and death, a canopy, table, chairs, perhaps also a rectangular spinet, complete the furnishing. Everything shows the purely structural form of the ideal of utility. The construction is in a reddish-brown wood; the angles are exceptionally accompanied by a modest inlaid band, the vertical angles of the cabinet were also formed as black half columns, not seldom with the execution of the base and capital in wrought brass plate. For particularly rich furniture the feet of tables and chairs were sometimes carved as lions' paws, and the furniture was adorned in suitable places by fine ornaments cast or wrought and chased in brass in a very pleasing manner, but very skilfully arranged. (Fig. 235). The careful protection of the furniture by coverings and the covering of the pictures with gauze show a high appreciation of the house furniture. These rooms, that have remained almost unchanged on many estates in the country, also produce in their pathetic modesty, in their genuineness and restraint a very strong impression, that constrains us, if we represent to ourselves the life led there by our fathers, the pressure under which they existed, their frugality, their endeavors, influences and hopes, that

they only timidly expected to realize. We must thoroughly consider them, in order to form for ourselves a representation of the character of the Biedermeier style, that as an art form of the smaller German citizens living in narrow conditions during an economically depressed time, unusually active intellectually, merits our particular interest in regard to the history of civilization and of art.

To the great architectural problems the Biedermeier style was always foreign. Its aim was always directed to modest requirements and to details, and it did not suffice for composition in general, where the statical functions of the architectural members were also to be taken into consideration.

If we review the previously characterized (page 268) artistic creations of Germany during the first epoch of the development of the Neo-Grecian style, we shall see that it was supported by an elevated conception of its purpose. An earnest endeavor for truth, for suitability in design and genuine materials, an assured intelligence and feeling for good solutions of good plans, for well harmonized proportions, and for a form of treatment full of character and faithful to the style, are expressed in the works of the more important masters. Even with extreme limitation of means, it understood how to give to its buildings grand lines and a dignified and imposing pose. The antique, the early Grecian art preferred, stood as widely independent from it as its French and English contemporaries.

The great national advance after the fall of Napoleon also had as a result an increased interest of the public in art and its problems. It on the one hand lay in the removal of constraint, that weighed on the spirit in the countries of Europe, on the other in the natural and historically necessary course of evolution of architecture, that it then gave opportunity for a more elevated freedom, cheerfulness and festivity. The severe style, principally developed from early Grecian art cleared itself gradually to Attic grace. Under the active fostering of art-loving princes architecture received grand problems, frequently proposed in the service of the national affairs, and in not a few cases, these were fulfilled by powerful designs and brought to monumental solutions. In the second

quarter of the 19 th century to one of the most intellectually and artistically qualified masters of architecture was allotted, to lead German Hellenism to a truly Periclean perfection, attained in no other country.

For the design of buildings of Neo-Classicism in Germany in regard to Catholic church architecture, of public buildings and of dwellings, substantially the same is true, that we have already said concerning the French (page 246). The similarity compelled in both countries by the preceding Rococo, by the influence of the antique and by the purpose itself, also had as a result harmonizing tendencies in the treatment of the ground plans. But in Germany the Protestant church architecture occupied an important place. In the 18 th century Protestantism produced no more important works after the great creations of Bähr, Schmidt and Sonnin-Prey (pages 175, 176, 192). Likewise the numerous writings from the beginning of the 19 th century, among which those published by the Berlin master Louis Catel in the year 1815, "Grundzüge einer Theorie der Bauart Protestantischer Kirchen" (Elements of a Theory of the Mode of building Protestant Churches) should be mentioned in the first place, but it contained no substantially new ideas. It is chiefly occupied by questions of style, although the ground principle of building in accordance with the purpose, that is according to the requirements of Protestant worship, it is not desired to state as -- self evident. What might have come into consideration as improvements on earlier designs, on account of the limited means resulting from the extraordinary exhaustion of the country, mostly remained only in sketches. When an improvement in conditions again appeared (in the second quarter of the 19 th century), architectural activity was individual, entirely dependent on the conception of the artist. In the great master from Germany's classic period, Carl Friedrich Schinkel, again appeared for German Protestantism a chief representative of its church architecture.

The transition to the purely classical style of architecture was earliest completed in the palaces of the kings of Saxony and of Prussia, and of the landgrave of Hesse-Cassel. In Dresden, where de Bodt and Longuelune (page 177) already before the middle of the century had influenced a return to classical

forms, the new tendency found entrance under the patronage of the art-loving king Friedrich August III at the same time. H. Soufflot planned the Pantheon in Paris (1757). Here as there Roman properties had long since been introduced in the theatres. Among the architects the first expressed classicist, Fried. Aug. Krubsacius (1718-1790) was appointed in 1784 professor at the Academy of Art, founded in 1763. He chiefly represented in his writings and buildings Blondel's claims (page 69). He was a zealous admirer of Knobelsdorf (page 196), even if in theory he also appeared against the Rococo still employed by him. In his first epoch, he still **returned** to Rococo forms, if he wished to produce great pomp. His ground principles:—simplicity in the plan, of the building lines and in the architecture, thus avoidance of projections, plain subdivisions of the walls, window enclosures without ornamentation and the rejection of pediment caps and all decorative work and the like, he embodied in his principal work, the Country House at Dresden, built in 1770-1773. The vast building is 252.6 ft. long, well proportioned in its masses and with a mansard roof, but it has only on the middle building a subdivision by simple wall strips. The interior contains a grand stairway. In his activity as a teacher, Krubsacius required a direct return to the Grecian antique. His associate in time and in art, Christian Traugott Weinlig (1739-1799), became more prominent by his writings and designs, than as a practical architect. He had studied for several years in Rome and in Paris, saw his ideal in the Roman antique, but in his endeavors to bring the series of forms of antiquity into the service of the new architectural problems, he had adopted the ground principles of Palladio, and particularly his theory of proportions. From 1790 he was in Dresden the upper architect of the country. With Weinlig's free art imagination, in particular not declining to the enjoyment of ornamentation (see the wall decoration by him in the chateau of Pillnitz Fig. 238), was sometimes even inspired by Barocco ideas. In Rome the grotesques of the antique and those of Raphael had fascinated him (volume 1, page 114; volume 2, page 190), whose style he introduced in Dresden at the beginning of the eighties in an extremely fine imitation.

In Berlin the classicistic architecture first came into use on the palace of prince Heinrich, now the University, built by the Hollander Johann Baumann the Elder (1706-1776) in 1748-1753, probably after a design by Knobelsdorf (page 196), a U-shaped plan, which only on the middle projection and on the fronts of the two wings exhibits a modest vertical subdivision. The Catholic church of S. Hedwig erected in 1747-1778 by order of Frederic the Great was built as a circular structure in imitation of the Pantheon at Rome. A greater advance was received by Berlin architecture through the gifted Carl von Gontard (1736-1802), born at Mannheim, who had received his training in Paris under Blondel, then practised in Bayreuth for the margravine there, then entering in 1765 into the service of her brother, Frederic the Great. He assumed the chief charge of the palace of Friedrichskron at Potsdam (page 197), the dome on which is referred to him, and added to it the so-called Commons as the enclosure of the court. This consists of two two and a half story buildings placed opposite the wings of the palace and characterized by a flight of winding steps in two flights, portico and dome, which are connected together by a semicircular portico with a triumphal arch at its middle. The charming and picturesque architectural group, in its classicistic architecture kept in the style of Louis XVI, is still dominated by a Barocco keynote. In Berlin Gontard erected in 1777-1780 at the Royal gate the Royal colonnades (Fig. 237), that also still produce an imposing effect in the present traffic of the great city. From 1781-1785 were erected the two domed towers 249.4 ft. high at the western sides of the German (New) and the French churches on the Gendarmes marketplace. (Fig. 238). These serve for no definite practical purpose. They are purely decorative monumental structures, but as such have high beauty of form, and on the broad place very effectively animate the view of the city.

With greater effect on the architecture of Berlin was the Brandenburg gate, erected 1788-1791 by Carl Gotthard Langhans (1733-1808), the first great creation of the Berlin Neo-Classical school in conscious adherence to the antique. (Fig. 239). In the plan of the gate between two wing structures, it was e

evidently desired to follow the model given in the Propyleion at Athens. But the massive columns 45.9 ft. high are still derived from the Roman-Tuscan order (volume 1, page 108). On this imposing architectural work is manifest the change from the graceful elegance of the principally French art of Gontard to an earnest Dorism. In the same direction, but still more strongly worked Heinrich Gentz (died 1811), who in his Old Mint, built in 1798-1802 on the Werder marketplace in Berlin, returned directly to the Grecian antique in the manner of the early Empire style. To a clearer conception of the nature of the antique came Upper Building Councillor David Gilly (died 1808), and particularly his early dying and highly gifted son Friedrich Gilly (1771-1800). From them radiated strong impulses on Berlin art creations; from their school also came the talented Schinkel, to be mentioned later.

In Cassel worked the expressed classicist Simon Ludwig Dury (Du Ry), of the artist family already settled there for two generations (page 190). His Museum Fridicerianum (1769-1779), an elongated building with 19 axes and a colossal Ionic pilaster order, a boldly projecting temple cascade, entire simple window enclosures and a crowning balustrade (statues) (Fig. 240), is a particularly severe structure in the classical sense, in many respects recalling the English works. Of smaller artistic importance is the palace of the elector, built by the same master in 1767, which in the 19th century was extended (1826) by the Red palace erected next the Museum. (Fig. 240). The chief work of S. L. Dury is the chateau of Wilhelmshöhe near Cassel (1786-1794), a palace kept within the classicism of the English school, that owes its fame first of all to the grand forest park surrounding it, and further dating from the Barocco period.

In an allied sense, George Moller (1784-1852), a pupil of L. Weinbrenner, to be mentioned later, was employed as court architect for the Hesse-Darmstadt line about the same time. By him was the theatre at Mentz (completed 1833), on which the semicircle of the audience room first evidently appeared on German soil, and likewise the Catholic Court church at Darmstadt (1827), a tasteless circular structure with an internal circular colonnade of 28 corinthian columns, on which rests

the dome, coffered in plain stucco.

At Würzburg in the palace after 1770 were built the vestibule, the stair hall and the left (Ingelheim) wing in the classicistic style, after men had advanced in the sixties to a simplified Barocco, in which certain classicistic motives had found acceptance. The hall represented in Fig. 229 dates from the year 1777. It is characterized by the developed German Pedantic style of the 18th century. In the 19th century grand duke Friedrich had the apartments of the right wing and also in part of the left wing, intended for the prince's court, newly decorated (from 1806) in the style of the later Classicism. The execution was under the charge of the then Court Building director Alexander de Salins de Montford (1753-1821), an architect coming from France in the storms of the revolution and settling at Frankfort-a-M., where he created a series of beautiful buildings, was in the Würzburg service in 1807-1815, then again returning to Frankfort. His apartments in the palace at Würzburg are arranged with refined artistic taste (Fig. 24-1), and belong to the most imposing interior decorations of the Empire style.

The most important south German representative of the severer Borism during the first quarter of the 19th century was Friedrich Weinbrenner of Carlsruhe (1768-1826), who had been educated in Zürich and Vienna, was in Italy from 1792 to 1797 (Rome, Paestum and Sicily), then after a brief engagement in Strasburg, receiving a call to his native city. There with most extremely limited means, owing to the misfortunes of the conditions of the time, he commenced a series of rich creations, full of character, that cause him to appear as an enthusiastic adherent of the classicistic theory in the conception of the Berlin master Langhans, of Gentz and the elder Gilly, but likewise shows the knowledge of English and French buildings. His works are characterized by model solutions of the ground plans and general proportions and by excellent construction and the effect of the surfaces. Among them are to be mentioned in the first rank the Evangelical City church (1807-1815), a rectangular hall plan with doubled galleries, a hexastyle Corinthian portico and a tower attached on the axis, and further the freely imitated from the Pantheon in Rome, the Catholic

church of S. Stephen (1808-1814) with an Ionic portico and a domed area of great span, 98.4 ft. wide, the margrave's palace on the Rondell Place (1809-1811) with a hexastyle Corinthian temple facade, that recalls English designs (Fig. 242), the stately city hall (1821-1825; Fig. 231), and as the last work of Weinbrenner, the nobly treated Mint (1826).

In the extreme southwest of Baden was erected in the 18th century an important architectural work, the Abbey church at S. Blasien (1768-1783), by the Frenchman Michel d'Ixnard, then Electoral Court Architect at Treves. It is a high domed rotunda of 150.9 ft. diameter with an internal circular colonnade of Corinthian columns, on which rests the dome 109.9 ft. diameter, an elongated choir and a vestibule between low angle buildings like towers. (Fig. 243). The entire architectural treatment shows the developed style of Louis XVI. In Stuttgart a pupil of Weinbrenner, Nic. Fried. von Thouret (1767-1845), who also became known as a painter, was chiefly engaged on the internal architecture of the palace. From 1796 he had charge of the building of the pleasure chateau at Hohenheim, where Goethe knew and learned to esteem him, in consequence of which Thouret was called to rebuild the prince's palace in Weimar (1790-1803). His remaining activity belongs to Swabia. Besides him in Stuttgart worked Giovanni de Salucci, the builder of the quite symmetrically arranged and refined pleasure chateau of Rosenstein (1823-1829; Fig. 244)., and of the palace W Wilhelm, erected (1840) as a permanent residence for the royal family, already conceived with greater freedom. In Munich Nic-Schedel von Greifenstein (1752-1810) built the Gate of Maximilian Joseph (1805), and Carl von Fischer (1782-1820) the Court theatre (1818), an impressive, organically well considered work with a proud octastyle Corinthian vestibule. *

** The theatre burned in 1823, but was again rebuilt after F Fischer's plans by von Klenze (page 288).*

In the Austrian imperial city of Vienna, the learned Joh. F Ferd. Hohenberg von Hetzenberg (born 1732 in Vienna, died there 1790), the first professed classicist and the architect most esteemed in the second half of the 18th century. The Gloriette (Fig. 245) picturesquely located by him in the park of Schönbrunn in 1775 is an extremely charming work, but with all

severity in design is still dictated by the picturesque invention of the Barocco period. A very much severer classicist was Peter von Nobile (1774-1854) from Switzerland, who erected the Burg Gate with a width extended to 236.2 ft. and in a very dry Dorism. In his enthusiasm for Grecian Doric art he went so far, that in 1822-1824 he erected in the People's park a copy of the Temple of Theseus at Athens. An allied conception was exhibited in Budapest by Michael Pollak (1773-1855), whose National Museum (1837-1841) has a grand temple facade composed of eight Corinthian columns.

About the close of the century appeared in Berlin a powerful and truly talented artist nature, Carl Friedrich Schinkel (1781-1841). He was born at Neuruppin as the son of a Protestant pastor, after his death went to the Gymnasium Zum Grauen Kloster (Gray Monastery) in Berlin, where there grew up in him from the association with the younger Gilly (page 278) a real enthusiasm for art and indeed both for painting and for architecture as well as the art industries. Under Gilly's guidance Schinkel made his first studies; after whose early death he also carried further a part of his works. With the means thus obtained he undertook a for him very instructive journey to Italy and France (1803-1805). With his strongly picturesque and poetical tendency, the grand landscapes there charmed him more than the architecture itself, and this only so far as it appeared as an especially effective object in the view of the monumental landscape. And therefore in a striking way, even in the land of classical art, he gave the preference to the Gothic architectural monuments with their animated outlines, living organism and rich subdivision, over the creations of the antique. When he had returned to Berlin and in his capacity as an architectural official in the state service, he more closely approached the principles of beauty of the Classicism then prevailing in Berlin, enthusiasm for Greece was aroused in him by a thorough study of the publications of Stuart and Revett (page 233). But he stood with greater mastery concerning this than all his contemporaries and predecessors of the Neo-Classistic period. To his fresh spirit and his free feeling for the beauty of form and for the nobly harmonized rhythm

of Greece, Hellenic architecture did not appear as a restricting and binding canon for later creative activity; for him it was elastic and capable of adaptation to new requirements. Under Schinkel's hands the form series of antiquity obtained body and soul in organic combination. We discover in his best creations a marriage of the German spirit with Greece in the same magical beauty as in Goethe's *Iphigenia*. To a blind imitation of the antique, that the seeking and attempts of the architecture of the Empire style committed, he was opposed. For each separate commission, he first based the architectural programme on the requirements to be satisfied by the structure. Then he designed the plan in reference thereto, indeed with a perfect taste for a pleasing arrangement of the building in the surrounding landscape. His works in this respect are still models today. The earliest building is the new Main Guard-house in Berlin (1813-1818). It has a fortress-like plan as an enclosed rectangle with square additions like towers to accent the angles and a double hexastyle Doric portico. The arrangement on this of relief ornamentation (goddesses of victory) on the frieze instead of triglyphs already manifests a freedom from the classical principles of form. In the year 1816 after the burning of the theatre built by Langhans, the master received the commission to erect a new building, for which the foundation walls of the old structure were to be utilized. The problem proposed there was particularly difficult, since on the limited area were to be arranged, not only a large number of rooms for the administration, but also a great concert hall. Schinkel solved this in design, ground plan and structure in the most splendid manner (1818-1821). To the grand and wonderfully harmonious external architecture (Fig. 246), with all the Attic purity inspired by a modern spirit, corresponds a just as happy interior decoration, a model in its way. From 1822 to 1823 Schinkel then erected the Old Museum, to receive the art collections founded under Friedrich Wilhelm III, on a site strengthened by piles and long continued work, with an imposing portico facade of 18 Ionic columns between ante piers and with a domed area enclosed by a circle of Corinthian columns, after the model of the interior of the Pantheon covered

by a dome. If this museum is not to be regarded as a model according to the requirements established today for such buildings, it cannot be overlooked, that its master desired to erect for the purpose there given a building in itself filled with beauty.

Schinkel also exerted a determining influence on protestant church architecture. In his numerous normal designs prepared for state and church officials, calculated for comparatively modest means are found both basilican and central plans and their combinations, as well as the ground forms represented in Fig. 121 (the hall church of T-form, the polygonal and the circular church, and even the form of the Latin cross). In certain plans he decided for a complete separation of the proper church for preaching from the church of the communion into two rooms, which were connected together by wide openings. In his later designs Schinkel gave the preference to the basilican plan with a choir niche. He placed the altar on the axis and the pulpit at an angle of the choir recess. Along both longer walls and the entrance side, he arranged galleries in two stories, with the organ in the gallery over the entrance. He characterized the facade by one or two towers, according to the means at hand. Schinkel's principal church work is the N Nicolai church in Potsdam, designed in 1826, but only erected in 1830-1842. (Fig. 247). On it he desired to solve the problem of the Protestant central building over a Greek cross not expressed externally and with a great dome, in the most imposing manner; the portico composed of six Corinthian columns exhibits a truly Attic grace and purity. The drum and the dome were only erected after the master's death by his pupil Persius (page 318). It also already shows in its Grecian treatment of details reminiscences of the Italian Renaissance. Persius likewise added at the angles of the substructure, designed as entirely enclosed by Schinkel, the timid pier-like little angle towers, which lessen the power of Schinkel's treatment of the building. A further church architecture of Schinkel, kept within Gothic forms, will be considered in the next Chapter. (Page 318).

At a time in which only limited means were at command for

architectural creations, Schinkel undertook great and important works for the entire evolution of modern architecture. To his talented designs also interior decoration and the art industries, for which he furnished numerous designs (of furniture, stoves, decorative utensils etc.), owe valuable suggestions and new forms. By far the greater portion of his architectural projects had the fate to remain unexecuted, thus his completely designed plans for a palace Orianda in the Crimea, in which with an unusually rich and wonderfully harmonious art imagination was permeated by the modern spirit, he had magically interwoven an entire form world of Grecian beauty with the magnificence of the southern nature. That another and equally spirited design for a royal palace on the Acropolis at Athens likewise never came to execution, we certainly do not desire to lament, on account of the preservation of the ruins there.

Schinkel was called away from his richly active life at a time, when by the accession to the throne of the art-loving king Friedrich Wilhelm IV (1840-1861), and after the restoration of the finances of the state, a prospect had opened for a rich development of his powers. Among his pupils were none, that received the artistic inheritance left by him on his elevated plane. It was less the personality, the artist nature, than the purely scientific regard and respect for historic order and correctness of form, that with them dominated architectural creation. The favorite architect of the king, Fried. Aug. Stüler (1800-1865) indeed proved himself gifted, many-sided and versatile, also unusually fertile in his architectural activity. He was a professed eclecticist; both in and outside Berlin he erected a great number of buildings in the most different styles. In Berlin he chiefly embodied the architectural ideas of the king, who desired to create a larger group of structures, similar to the ancient imperial forums (volume 1, page 117) and conceived as the "Forum Fridericianum". At his command Stüler first built the extensive but tasteless New Museum (1841-1857), whose piece of magnificence was to be formed by the vast stairway hall with the visible roof trusses, but which can scarcely be satisfactory in spite of its splendid decorations. Then in the centre of the design should be

placed a peripteral temple. But only a pseudoperipteral building (volume 1, page 62) was erected, with an octastyle Corinthian pediment facade at the end and the colonnades surrounding the entire design. Even the exterior can produce no especially favorable impression by the unfortunate proportions, by the exceedingly high base and the windows on the longer side jammed between the half columns, than the construction of rooms for containing the works of the later German art exhibits the entire absurdity of the idea of employing the scheme of an antique temple for a museum. Stüler only furnished the plans for this building, that received the name of National Gallery. The execution was in the hands of Heinrich Strack (1805-1880), a pupil of Schinkel. It was carried out in costly materials and a very refined treatment of the details. The National Gallery is the last great architectural work of the Berlin Neo-Classicism.

** Eclecticist (derived from the Greek word for a "selector") is a designation commonly employed recently for artists and philosophers, who do not profess a definite style of theory, but seek to select or combine from preceding tendencies the one appearing suitable for the particular case.*

In Bavaria the evolution of the architecture of the later Neo-Classicism (page 273) followed the tendencies of the art=zealous king Ludwig I (1825-1848), who appeared to have inherited the love for building from the Bavarian regent of the 18th century, and who fostered Hellenism as an enthusiastic venerator of Greece. He found in Leo von Klenze (1784-1864) an architect, who was to win for Munich and south Germany an importance, like that of Schinkel for north Germany. Klenze, born in Hanover, in his university studies in Berlin came into contact with the group of artists around Gilly and Schinkel. The latter made him enthusiastic for art and antiquity and also gave him the first guidance in the study of architecture, then taken up by him. In the year 1803 he went to Paris, where he continued his studies with Percier (page 253), then in 1805 to England for a brief stay, and later until 1808 to Italy and Greece. Ludwig was still crown prince, when his attention was drawn to Klenze by his design for a European Peace m

monument. He called him to Munich and there prepared for him the ground for a fertile activity. Klenze's first building there was the Glyptothek erected in 1816-1830 for the exhibition of the valuable collection of sculptures. He planned a design well suited for the purpose with four wings around a square court. To the facade he gave a massive middle building, occupying one-third of the entire width and rising above the adjacent wings, and which was treated as a Hellenistic temple facade with eight Ionic columns. Otherwise he animated the surfaces of the facade by six niches within enclosures like windows, that were to receive statues of prominent artists and friends of art. He also employed there earlier Empire forms, based partly on the Roman antique, partly on Palladian motives. Nevertheless the building has a unified and stately effect of the facade, in which its purpose is clearly expressed. From the enthusiasm of the king for Germany's great men sprang the idea of erecting a "temple of German Honor", named the Walhalla, on a hill on the Danube near Regensburg and visible from afar. Klenze designed a Doric peripteral structure with 8×17 columns, which was executed in a grayish-white unpolished marble, and should be enthroned on a massive terraced substructure in a sublimity recalling the Parthenon (volume 1, page 86). The exterior enraptures by the imposing architectural appearance, and on closer examination by the almost unsurpassed purity of the style. Not entirely at the same elevation stands the interior, formed as a cell 50.9×178.8 ft. (Fig. 248), even if it does not lack a tasteful general effect, particularly by the splendid lighting by skylights (as a hypaethral temple: volume 1, page 64). In the internal decoration, the creative power dominating the entire architectural organism to even the last detail, Schinkel was doubtless superior to the Bavarian master. But it must be said in favor of Klenze, that he was even more free in the external architecture than Schinkel. After the Walhalla was completed, Klenze received the commission to erect on the Theresien meadow a Doric Hall of Fame (1843-1853) as a recognition of "Bavarian merit and fame". It was built as a duodecastyle colonnade with a peripteral temple with 4×7 columns projecting at each end. Before

the structure stands a colossal statue of Bavaria, modeled by Schwanthaler and cast by Miller in bronze, that has a very effective background in the Hall of Fame. Klenze's most mature work must be the Propyleum, that the king had built as the entrance gateway to the King's Place laid out before the Glyptotek in 1846-1863. Fig. 249). The master placed the hexastyle gateway passage, kept in bold Doric forms, between two towers like pylons (volume 1, page 19), thus retaining in the form a notable independence from the famous model on the Acropolis at Athens. The gateway structure is very happy in its general proportions, is treated in its details in complete purity of style, and affords a truly monumental termination to the broad and harmonious Place. It is indeed the most characteristic architectural monument of the spirit of Munich of that time.

Besides Klenze the Architecture-loving king also took other architects into his service. Among these Friedrich von Gärtner (born 1792 at Coblenz,; died 1847 at Munich) stood next to Klenze as highest in the royal favor. Gärtner had likewise received a classicistic training, later visited Paris, Italy and Sicily, and in 1829 also published a work on the monuments of that island. But he was rather a submissive being, accepting the ideas of the monarch, than an acute and refined artist. By him with the assistance of Klenze the king had prepared the design for the Hall of Deliverance (Befreiungshalle) near Kelheim on the Danube. This was begun by Gärtner in 1842, carried farther in 1847 by Klenze, and was dedicated on Oct. 18, 1863, the fiftieth anniversary of the battle of the nations near Leipzig. The purpose of the building is evident from the inscription cut in the marble floor:--"May the Germans never forget, what made the war for deliverance necessary, and by what they conquered". The Hall of Deliverance is a colossal rotunda with a coffered dome, in the interior of which are placed 34 goddesses of victory by Schwanthaler. In the walls are inserted tablets with inscriptions, that refer to battles, fortresses and commanders. On the exterior the arrangement of buttresses, on which are placed maidens as the supporters of tablets with the names of German races, mediaeval motives are already perceptible. In the entire appearance of the building

is clearly expressed the German **Grundtone** corresponding to its purpose. Gärtner was also the builder of the Gate of Victory (Siegestor) at Munich (1843-1850), an almost pure copy of the Arch of Constantine at Rome, as well as of the Pompeian House at Aschaffenburg (1842-1849), which indeed presents a good idea of a Hellenistic house, (the temple of Castor and Pollux in Pompeii served as a model), but otherwise only interests us as a characteristic of the artistic inclinations of the enthusiast on the royal throne. (Fig. 250).

At the time when in Munich, on the Danube and the Main, the works just mentioned were executed as the last important evidences of the south German Neo-Classicism, there also originated buildings in the capital and other places, that took the architecture of the middle ages and of the Renaissance as models. Hellenism had gradually died out, even in the eyes of its most zealous patron, king Louis I. From the beginning of his architectural activity in Munich, Gärtner had cherished the Romanesque architectural ideal. But even Klenze, the professed Hellenist, must content himself in employing the forms of the Early Christian, also directly derived from the antique, and of the Italian Renaissance, at the request of his royal patron.

4. Architecture of Neo-Classicism in Italy and Spain.

At the beginning of the second half of the 18th century, Italy long had not had control of its fate in its own hands. Already in the 16th century the provinces composing the existing monarchy were divided into the kingdom of Naples and Sicily, comprising about the southern half of the peninsula, the States of the Church lying in the middle around the capital Rome, and several duchies occupying the northern parts of the country, which from 1580 and during the 17th century in greater part belonged to the Spanish empire. During nearly the entire 18th century Austria and Spain contested with varying results for supremacy in Italy. Finally Napoleon I made his conquests on Italian soil and his deep encroachments on the internal conditions and the entire public life. Only after his fall were gradually collected those forces, that raised the land out of its weakness and divisions (in the year 1860) to a united and energetic kingdom.

Likewise in art life in the course of the 18th century Italy must yield its leadership to the northern lands, and that had controlled since the victorious campaign of the Renaissance over the western world. About the middle of that century it still exerted a mighty influence on the northern countries. But this was terminated, not by new model architectural works in a great style, but by the creations of antiquity, by Pompeii and the Roman antiquities, that were spread over all civilized lands in Piranesi's engravings. The teachings published by Piranesi and Winkelmann found a favorable soil in Italy, where Winkelmann was counted among the Romans with a certain justification. Already the entire third period of the Barocco style allows the recognition of a progressive clarification in the classicistic sense. Juvara, Vanvitelli, Salvi, Galilei, and Marchione (pages 39, 40) may pass for direct precursors of Neo-Classicism. The transition to that was also completed almost imperceptibly, first indeed in a return to the forms of the Italian late and high Renaissance, particularly in the paths previously pointed out by Palladio and Alessi (volume 2, pages 229, 233). The adherence to these was so close, that certain buildings until in the most recent period were regarded as wo-

works of the Renaissance. Thus for example, the house (casino) di Livia erected on Place S. Marco in Florence in 1775 by Bernardo Fallani, was explained ~~as a~~ work of the late Renaissance, although many details (the ornamental decoration of the windows in the ground story, the forms of the consoles at the balcony and at the windows of the ground story), plainly indicate its origin in the classicistic period. (Fig. 251). Likewise the facade of the church of S. Marco in Florence, built in 1780 by Giovacchino Pronti, by a comparison of styles was erroneously dated (as a work of the 17th century, without regard to the low reliefs characterizing the classicistic period, the refined drawing of the members and the style of the ornamental decorations in the side panels of the upper, and on the niches of the lower story. (Fig. 252)).

Scientific investigations already in the first half of the 18th century had been thoroughly made into the ancient Etruscan art. They were carried on by the Etruscan Academy founded at Portoferraio in 1726; in 1738-1759 followed the publication of the results of research. But although in Tuscany the Etruscan civilization was held to be older and therefore more important than Roman, Grecian or even Egyptian, its effect was exerted less in architecture, than in decoration and the minor arts, particularly in pottery. The Romans learned in art under the lead of Winkelmann energetically combated this preference, onesided and overestimating Etruscan art; they demanded the closest adherence to Greece, which afforded the only possibility to lead the decadent architecture to the sunny heights of pure art. But only in the first quarter of the 18th century, particularly under the influence of French monarchs, the previously still chiefly cultivated tendency of Palladio, though also clarified and enriched by new decorative details, yielded to the intended Hellenistic Neo-Classistic series of forms, in reality principally Roman, developed with a strong addition of the French art style of that time. This then maintained itself until the era, at which the Italian country again reached its maturity, till the founding of the united kingdom.

The earliest Italian artist of importance, who consciously turned from the Barocco to Classicism, has already been ment-

mentioned; Giovanni Niccolo Servandoni (page 235). He was a distinguished decorator; as such he was called to the great Opera in Paris. The severity of his drawing went so far, that he himself painted his decorations according to statical laws in opposition to the capricious and picturesque representations of the Barocco masters, so that they might have been executed directly in solid materials. Likewise already known to us by his drawings of the Roman ruins, Giov. Batt. Piranesi (1720-1778), from the school of Vanvitelli (page 39), also appeared as a practical architect. His church of S. Maria del Priorato, erected on the Aventine (about 1765), contains many additions from the later Empire style. A richer activity was developed by Michelangelo Simonetti (1724-1781), who at the command of Pope Pius VI (1775-1795) created in the Vatican palace the halls of the muses, of the rotunda, of the Greek cross and the beautiful double stairway. About the same time Cosimo Morelli (1730-1812) built for the Pope as a private palace the grandly planned palace Braschi in Rome (1780-1790) in a rich Classicism based entirely on the Roman antique. On it the style of composition of the Barocco is directly translated into classical details. The building is famous for its magnificent stairway. (Fig. 253). An allied treatment may be recognized in the Bracchio Nuovo (New Wing) of Museum Chiaramonti at Rome by Raffaello Sterné (1771-1820), a work distinguished by well considered proportions and harmonious coloring. After him Giuseppe Valadier (1762-1839), the archaeologist of Napoleon I, was also the leading architect of Rome. At the order of the emperor he excavated the Baths of Titus and the Roman Forum and restored the Arch of Titus (volume 1, Fig. 146). Valadier erected several palaces and churches, among these being the facade of S. Pantaleone (1806), which is kept entirely in the style of the French Empire (Fig. 254); he was also the creator of the beautiful plan on Monte Pincio (1806). As the last great work of Roman architecture of this period, we have to mention the basilica of S. Paolo-f-l-M. (volume 1, page 159), rebuilt from 1825 after the fire of 1823, that was executed on the old foundation walls by Pasquale Belli (1752-1833) and Luigi Poletti (1792-1839) and decorated internally by modern detail forms.

In Naples the church of S. Francesco di Paolo (1718-1828), erected by Pietro Bianchi from Lugano (1787-1849), is the most important work of Neo-Classicism. It is a domed building after the style of the pantheon with a portico of eight Ionic columns between ante piers, whose colonnades on the ground plan of a half ellipse adjoin, after the model given by Bernini on the Place of S. Peter at Rome.

Upper Italy has a larger number of important classicists to be indicated. At Genoa architecture in the second half of the 18 th century followed the path of Galeazzo Alessi (volume 2, page 233). We there meet with Charles Dewailly, already known to us (page 245), a pupil of Servandoni on palace Spinola, that the latter built entirely in Alessi's sense. Later Dewailly, like Servandoni, went to France (page 292). The Camposanto (cemetery) erected by Carlo Barabino (1768-1835) with severe Doric porticos and a cemetery church arranged as a domed rotunda (Fig. 255) already permits the recognition of the national ground tendency. Giuseppe Piermarini (1734-1808), a pupil of Vanvitelli and as such already engaged on the palace at Caserta (page 37), developed in Milan a rich activity in the Palladian tendency. He built there palace Belgioso, to which he gave a dignified pose by a well proportioned and evident arrangement. The elongated facade with 25 axes is interrupted at the middle projection by four three-quarter columns of the composite order extending through both stories. At the middle of each adjacent wing a projection is only indicated in the upper story by four pilasters. Between the windows are added recessed relief slabs. Piermarini was also the creator of the famous theatre della Scala in Milan and the graceful villa Reale at Monza. In Pavia he conducted the rebuilding of the University, whose magnificent court he surrounded by arcades on 300 granite columns. His pupil Leopoldo Polack (1750-1805) employed for the palace della Villa Reale (1790) colored materials, whereby the noble Palladian-Classical architecture of the garden facade, subdivided by a broad middle projection and two side projections with pediments, the elevation consisting of a rusticated ground story and a great Ionic order, exerted a clear and cheerful effect. The Napoleonic epoch is characterized by the Arena for containing 30,000 spectators, built

by Luigi Canonica (1767-1844), with the royal box in the form of a small Corinthian temple (1805), and by the arch della Pace, erected by Luigi Cagnola (1762-1838), finely treated, which in general may pass as a copy of the Arch of Septimus Severus in Rome in enlarged proportions. The principal work of the later classicistic architecture of Milan is the church of S. Carlo Borromeo, designed by Carlo Amati (1776-1852) in the year 1828 but only commenced in 1836 and dedicated in 1847, a circular building in the style of the Pantheon, also based on the theories of Vitruvius by the scientific master. In Venice Tommaso Temanza (1705-1789) worked in the sense of the masters of the late Renaissance of upper Italy (volume 2, page 229), with which he occupied himself by publishing their biographies. His most important architectural creation is the church of S. Maddalena, a circular structure on which the antique columnar orders are directly imitated. Greater fame was attained by his pupil Giov. Ant. Selva (1753-1819). He had studied in Paris and England (there also particularly the plans of houses), and then exerted a fertile activity in Venice as an instructor. He built there the theatre Fenice (1800-1806), which after the fire of 1836 was again restored to its original condition. His most important church creation, the church at Possagno, that was at the same time erected as a tomb church for the celebrated sculptor Canova, is a very noble circular building after the model of the Pantheon with a finely designed octastyle portico with pediment, which in purity of drawing approaches the Parthenon. Selva in Venice was the last important representative of the matured Neo-Classicism.

SPAIN passed through a period of great advancement under the government of Carlos III (1759-1788), which elevated agriculture, industry and commerce, and also carried on the internal administration with a strong hand. But under his weak successor, Carlos IV (1788-1808), in consequence of the favoritism of the vicious queen Marie Louise, the country constantly degenerated, until after the destruction of Spanish naval power near Trafalgar, it was compelled to yield the throne to Napoleon. From 1808 the Spaniards undertook a war of freedom against France, that with England's help restored their freedom in the year 1814. But the country never acquired political importance

and internal peace. Even the Spanish colonies on the continent of America obtained their independence. Misgovernment and the rebellions of the powerless and passionate people from thenceforth the marks of the internal conditions of the Spanish monarchy. But in the domain of intellectual and art life the proud Spaniards ~~ever~~ regarded themselves as a great power, and the recognition cannot be denied to them, that in general they have maintained a position of consideration among European nations. By the Academies at Madrid and at Valencia, whose opinions supported the entire public architecture, centres were provided for art creations, that showed themselves favorable in a high degree to the introduction and generalization of Neo-Classicism.

About from 1760 onward architecture under the leadership of its great master Ventura Rodriguez (page 47) turned aside into classicistic paths. It retained a national stamp, in so far that it adhered to the tendency pointed out by the elder Herrera. (Volume 2, page 243). Rodriguez, the first professor of architecture at the Academy of Art, founded in the year 1752 at Madrid, had stated that the extraordinary clarity and grandeur of arrangement of the buildings of Herrera and their simple and classical form would permeated by the true Spanish spirit, was a direct model for an innately true and national art style. To him is due the merit, that the architecture of his native land at a time, when nearly everywhere a colorless internationalism was aimed at, under the active patronage of its great king and independently of foreign lands, raised the national standard in the spirit of the modern time. Among the numerous works of the unusually fertile master, besides the previously mentioned internal architecture of the cathedral of Nuestra Senora del Pilar at Saragossa, and the facade of the cathedral at Pampeluna (page 53), standing on the stage of the transition, we also have to mention here the church of S. Felipe Neri in Malaga (1778), an elliptical central plan with 16 Corinthian columns enclosing the domed area, two graceful facade towers and an impressive portal, emphasized by four Composite columns. An early work of Spanish Neo-Classicism in a conception remaining midway between the Italian school and that of

the elder Herra, in the church of S. Francisco el Grande in M Madrid (1761-1784), designed by Fr. Francisco de las Cabezas (died 1773). It is a central building over a circular domed area of approximately 108.3 ft. diameter. The principal axis is accented by a rectangular entrance exedra with three-aisled arched portico and the opposite narrow rectangular choir projection terminating in a semicircular apse. At each side are arranged three radial chapels of square ground plan (Fig. 256). The showy ornamental decoration dates from the 19 th century; it was executed on the occasion of the arrangement of the church as a national Pantheon (1837).

By Francisco Sabatini (1722-1797), a native of Spain, who had studied in Palermo humanistic, philosophical and mathematical sciences, but then turned to architecture, resulted the transition from the early Spanish Classicism to Hellenism. Sabatini had already received his training with Luigi Vanvitelli. (Page 39). He was engaged under him at the building of palace Caserta, whose employer was the later king Carlos III, and noticed him. After the Spanish crown had fallen to him, he appointed Sabatini an engineer officer and called him to his capital (1760), where was opened to him beside Rodríguez a splendid course, both as military as well as royal court architect. Likewise Sabatini still permitted Barocco inclinations to be recognized in his first works, but clarified evermore toward a Hellenistic-Classical expression of form. It is characteristic for the advance in the spirit of architecture beginning in the last quarter of the 18 th century, that in competition with the highly esteemed and powerful Rodríguez, he won the victory, since his principles were held by the learned world, By which the Grecian culture was more highly esteemed as one far excelling the Roman, purer and higher. On his buildings of the gate (puerto) de Alcalá and gate de S. Vicente, as well as on the stately Customs building (Aduana) at Madrid, completed in 1768, is expressed an advance from heavy forms to a lighter and more slender treatment. But a certain cheerful beauty, which distinguishes them from the works of Rodríguez in a severe and monumental character. The convent S. Ana erected at Valladolid exhibits in the noble simplicity and dignity the proportions of form expression of the most mature stage of Sab-

Sabatini's art.

The climax of Hellenism on Spanish soil was attained by his talented pupil, Juan de Villanueva (1739-1811), who finally occupied the post of general director of the Academy of S. Fernando and of first royal architect. His buildings are famous by the circumspect composition in happy proportions, the elegant subdivisions, the purely drawn profiles and contours, and the frugal and refined ornamentation, an "Atticism", that distinguishes them from the works of other masters. The Museum del Prado, built from 1785, with the open Ionic portico exhibits his style already in full maturity. His chief work is the Astronomical Observatory at Madrid, which in its clear arrangement of the ground plan, the imposing vestibule of six Corinthian columns, the dome well treated as an Ionic circular temple, and the refined handling of the details, reaches the high elevation of the creations of the German Hellenist Schinkel.

In the 19th century under the unfavorable internal and external conditions, the art imagination of the Spaniards no longer came to a free and grand development. It remained in artistic respects almost entirely dependant on foreign countries, without being able to transform their series of forms in the national sense. The Spanish nation too indeed bore the yoke of Napoleon, and had produced an important creation in the Gate (puerta) de Toledo in Madrid (1814-1827; Fig. 257), built by Antonio Aguado, in which was later effective the spirit of the Spanish high Renaissance with French Neo-Classistic influences. But the Parliament Building erected by Narciso Pascual in 1843-1850 as the last great work of the first half of the 19th century, with a stately Corinthian portico bears entirely the character of an academic and purely Roman Classicism in its design.

5. Architecture of Neo-Classicism in the Netherlands and in Scandinavia.

The diversity of the bases afforded in the southern and northern portions of the Netherlands for the evolution of architecture, to which we have previously referred (page 103), is likewise expressed in the period of Neo-Classicism.

BELGIUM meanwhile had a varied political history. Until 1794 it was under Austrian rule, then under French supremacy. In the first peace of Paris (1814), it was united with Holland in the kingdom of the Netherlands. From 1830 after the revolution extending over all Belgium against the union, it formed an independent state. Austria had endeavored by thorough reforms to produce an internal attachment of Belgium to the Hapsburg empire, without attaining any deep result. Indeed by the Austrian measures the independent development of the architecture was restricted, which was so strongly prominent in the preceding epoch. In its further course it did not follow the lead of Austria, but that of France, which was closely allied to the nation. From France Classicism was also introduced into Belgium.

The first important architect in the new art tendency was the Frenchman Guimard. By him was the plan of the upper city with the dignified Place Royale (1772), that in many respects recalls the Place Stanislaus at Nancy. On it he erected the palace of the counts of Flanders, whose ground plan in U-shape with a great court enclosed by a wall and two portals after that of the French mansions. The architecture with wall strips extending through one and a half stories above a high rusticated story, recalls the Saxon and Vienna works of the early Classicism. To Flemish taste attention is further paid by a luxuriant ornamentation. Besides the palace, Guimard erected the scarcely classical church of S. Jacques-sur-Candenberg, (1776-1885), with an imposing Roman corinthian temple facade and bell tower. It so nearly approaches the architectural appearance of the antique religious buildings, that in the time of the French revolution, it was declared a temple of reason, on which the statues of Moses and David should be replaced by those of Pycurgus and Solon. Guimard also erected on the Pla-

Place Royale the Palace de la Nation (1779-1783), on which may be recognized already a more mature stage of the development of Neo-Classistic architecture. (Fig. 258). For the plan the master took as a model the English government building, that exhibits an impressive peristyle and a great semicircular assembly hall with seats rising like an amphitheatre, as the most important parts. His pupil Louis Joseph Montoyer (died 1800 in Vienna) passes for the buider of the chateau at Laeken (1782-1784), for which the owner (prince Albert of Sachsen-Teschen himself made the design. It is kept in the simple and dignified forms of the later style of Louis XVI, cultivated by the Blondel school.

The larger buildings of the period first originated in the 19 th century. The principal work, the Royal palace at Brussels (Fig. 259), was built by the native architect Van der Straeten in 1820. It adheres so closely to Antoine's Mint at Paris (page 243), that it may almost be regarded as a copy of that. A leading importance in Belgian architecture of the later Neo-Classicism was won by Ludovicus Roelandt (1786-1864), who indeed in general followed the tendency held by his teacher Percier, but chose a free standpoint outside that. He was the creator of the University building at Ghent (1826), famous in his time, that contains a magnificent circular columnar hall; on the facade the master rejected all ornamental work, in opposition to Percier's style of art. On the palace of Justice there, a noble structure on the Scheldt with 13 x 11 axes and a high flight of steps, above which rises a hexastyle Corinthian portico, there may already be recognized an expressed inclination toward the Italian Renaissance of the Palladian type. Beside Roelandt worked the likewise very gifted Tieleman Franz Suys (1783-1861), who had also received his training with Percier in Paris, but had also undertaken studies in Rome and southern Italy. In Brussels he created the conservatory of the botanic garden, in which he combined the modern appearing iron construction and glazing in the happiest manner with entirely classically treated rows of Ionic columns.

To HOLLAND belongs the later activity of Suys. There architecture, already during the entire Barocco period, had stood

in the path of Palladian Classicism (pages 109, 111, 112). The movement occurring about the middle of the 18th century in the art life of the adjacent countries in favor of a reform of the art activity in a classicistic sense, therefore led in Holland to not essentially new conceptions. Architecture also had in the 18th century no large problems to master. There were lacking deep artistic influences. But few more important public buildings were erected. Private buildings indeed by the increasing wealth of the maritime commercial masters increased in spaciousness and in expenditure for internal decoration. The style of Louis XVI found admission into them. But on the exterior a tasteless brick style continued determinative, that presents only a slight artistic interest.

Of famous architects of the second half of the 18th century, we have to mention J. Husly (died 1795), who erected the city halls at Weesp and at Groningen, and further the two brothers Jan David and Korel Zocher, the former erecting about 1780 the Bourse (Exchange) in Amsterdam, the latter the Catholic church at Utrecht. They remained almost entirely within the tendency followed by Pieter Post and Philip Vingboons (pages 118, 120). In the 19th century Holland had in T. Fr. Suys (page 300) an important representative of the developed Neo-Classicism. In the year 1820, thus at a time, when Belgium and Holland were united in one state, he was called to Amsterdam as professor. On his works, of which the Museum of Antiquities at Utrecht (1825) is treated in Neo-Greek forms, the Old Bourse (Exchange) there (1845), animated by an Ionic portico, but otherwise very tasteless, the New Lutheran church at Amsterdam and the Catholic church at the Hague may be mentioned, the classicistic and very modest profiles of the architectural members appear only as an animated decoration of the facades of the building, whose execution in the native brickwork indicates a new art spirit.

To DENMARK, of the Scandinavian kingdoms, under Frederic V (1746-1766) and Christian VII (1766-1808) was assigned a long period of peace, during which particularly by the intelligent government of the latter, agriculture, commerce and manufactures, the sciences and arts were elevated. Their successor Frederic VI (1808-1839) entered the German federation in the year 1815 to better protect his country from oppression by the

English. But Christian VIII sought to create an entirely independent Danish free state. But his endeavors did not have the result hoped for. In the year 1864 in the contest with Prussia and Austria, the southern province of Schleswig-Holstein was lost. The Danish state was restricted to the provinces lying outside the European mainland. In spite of this loss of political importance, the Danish people, in consequence of their fortunate equipment in scientific and artistic respects, have retained a respected position among the German family of nations. In the second half of the 18th century, it took a famous part in the further development of modern art, and in the 19th century, its artists, at the head of which stood the instructors at the Academy of Copenhagen, attained high regard and an influence deeply affecting Germany.

In Copenhagen Nic. Eigtved (1701-1754), whom we have previously seen as the builder of the Amalienborg (page 220), led the transition from Barocco to Classicism. He was succeeded by his pupil and son-in-law George David Anthon (1714-1781), who made himself a name by the publication of the "Danish Vitruvius". To the great Frederic's (marble) church and the participation of the French architect Nic. Henr. Jardin (1720-1790), working in the early Classicism of Jacques Ange Gabriel, we have already referred on page 219). Jardin had likewise built the small but dignified little chateau of Marienlyst near Helsingør entirely in the French style. His pupil Casper Frederik Harsdorff (1735-1799) is the first Danish Hellenist. His most important buildings are the Ionic colonnades at the Amalienborg (Figs. 196, 260). As further advanced in the knowledge of Greece appears his pupil Christian Friedrich Hansen (1756-1845), the creator of the noble Frauen church (1811-1829). This is a basilican plan with semicircular apse and two story choir aisles extending along the sides, which below opened between fluted Doric columns into the principal room. By a coffered tunnel vault over the middle aisle and a similarly treated niche vault over the apse, the interior of the church received a harmonious covering. (Fig. 261). The entire interior with the blessing Christ in the altar niche also produces a harmonizing impression, even with the pagan architecture. The

tetrastyle portico exhibits a maidenly purity and severity, that recalls the best works of the best Grecian period. Likewise the Balace church at Copenhagen erected in 1826 by Hansen is a basilican structure with a simple outer aisle around the room for the preaching and a tetrastyle portico. Of the two severe Danish Hellenists, the brothers Christian (1803-1883) and Theophilus Hansen (1813-1891), the elder erected the Museum of Natural History. Theophilus chiefly devoted his powers to foreign countries. We shall meet with him again in Athens and in Vienna. (Page 333).

NORWAY first obtained its independence from Denmark in the year 1814. Thenceforth this youngest of the three northern kingdoms surrounded by the Sea took an active part in the cultivation of the sciences and arts. From 1811 to 1813 was built in Christiania the University buildings, for which the Berlin master Schinkel had furnished the designs, but which were worked over by Grosch before execution. The building erected for the Faculty of Natural History is at most a characteristic showpiece of the architecture of Neo-Classicism, distinguished by a columnar portico crowned by a pediment in a noble Ionic treatment.

Likewise the houses (page 221) received after 1770 a new appearance. The native mode of wooden construction, that corresponded to the climatic conditions in this respect, also henceforth continued in use. But in the number, dimensions and arrangement and connection of the rooms became perceptible a thorough consideration of convenience. The kitchen was separated from the living room, and the fireplace with the hood was replaced by a stove. The previously light vaulted ceilings were treated as horizontal beam ceilings and covered by boards in a subdivision like coffers. The walls received inside and often outside also panelings with rectangular framing. Likewise the windows were enclosed by wooden frames and applied moldings. As the covering of the roof, tiles were gradually adopted. The ornamental decoration, for which the Norwegian people had such high innate gifts, was also suppressed under the influence of classicistic ideas, but was expressed so much more abundantly in the minor arts.

For SWEDEN the first half of the Classistic period was a time of internal and external weakness in consequence of the stupid politics of its government. First under the powerful House of Bernadotte, that Carl Johann (Carl XIV), a general from France and elevated to the royal dignity by his success in war, had founded (1818), the country assumed a renewed advance, that continued until our days and made possible for its scientific and artistic powers an independent participation in the modern intellectual life.

Swedish architecture in the time of the Barocco style had satisfied the structural requirements in such rich measure by a great number of important churches and secular buildings, that in the succeeding epoch must occur a quiet period. The Classistic forms came into use to an increasing extent after the middle of the 18 th century. As architects to be named after Horleman's death (page 226) are count Carl Joh. Cronstedt (1709-1779) and Joh. Frederick Rehn (1717-1793), indeed without referring also to epoch-making creations by them. The leading master was Carl Frederik Adelcrantz (1716-1796), whom we have already known as the builder of the little chateau Cina in the park of Drottningholm (page 226). He was famous for an universal power, clarity and purity in the expression of forms. But he remained still in the tendency of Roman antique Classicism. The Opera House erected in 1775-1782 by him at Stockholm (Fig. 262), and the Adolf-Frederick's church, arranged as a central building, whose dome was completed in 1783, are evidences of his dignified style. Of the works of Swedish architecture originating in the first half of the 19 th century, only the little chateau of Rosendal in Stockholm created by Frederik Bloms is to be mentioned (1823), that is entirely treated in the forms of the matured French Empire style.

6. Architecture of Neo-Classicism in eastern Europe and America.

The transplantation of the culture and art of western Europe to Russian soil commenced by Peter the Great (page 228), was zealously continued by the empress Catherine II (1762-1796). She called foreign artists to Russia, especially Italians and Frenchmen. Besides these also appeared German and native masters with the greater creations.

The chief part in such a rich architectural activity of the Russian court in the first half of the Classicistic period fell to an Italian, Giacomo Quarenghi (1744-1817), who had been educated in Rome. His most important creations at S. Petersburg are the Building of the General Staff, the Gallery of Paintings, the Catherine Institute and the Theatre of the Hermitage. They exhibit a striking inclination toward long facades, that are subdivided by middle and side projections. On the rusticated substructure with round-arched doorways and windows rise two upper stories of nearly equal height, that exhibit columns on the projections and pilasters on the recessed portions. Quarenghi's buildings thereby received a clear, although a rather pattern-like treatment. In the English garden at Peterhof, he erected the English palace, whose garden facade, behind a broad flight of steps, shows a portico entirely in the English-Palladian style, and a Bath design in Zarskoje-Selo, for which the Russian baths were taken as a model.

Among the native architects of this time Wasilij Iwanowitsch Baschenow (1737-1799) was the most prominent. He created in Moscow the richly treated villa, now utilized as the Rumjanzow Museum, before whose middle building is placed a Corinthian portico with horizontal top, while the rich side pavilions are treated like facades of Ionic temples with pediments. His somewhat younger contemporary Iwan Egorowitsch Starow (1743-1808) erected the palace Taurish of Catherine II and the Cathedral of the Trinity in the Newskij Monastery at S. Petersburg (1756-1814). This is a classical central building, on which above the single lower story, subdivided by Tuscan pilasters and with a hexastyle Tuscan portico with pediment, rise two front towers and a dome. The drum, like the front towers, is covered

by a **system** of Corinthian pilasters.

307 The French school of the early Dorism as represented by Chalgrin and Dewailly (page 245) was taken to S. Petersburg by Thomas de Thomon (1756-1814). His Bourse (exchange) there with its 44 Doric columns exhibits a striking similarity to the Bourse in Paris (page 252), originating a few years earlier, and produced by the similarity of the art conception.

The style of the matured French Classicism is expressed on the church of S. Isaac in S. Petersburg, built by Ricard de Montferrand (1786-1858), a pupil of Percier. The design in any case was influenced by the Pantheon at Paris as a model. But the architectural masses on the church of S. Isaac appear more unified and therefore more effective, since the ground plan forms a rectangle in outline, from which projects at each longer side a double, and at each end, a single octastyle Corinthian portico with pediment, in entirely symmetrical arrangement. In the internal arrangement the Armenian cross (volume 1, page 198) is expressed by the extension of the circular domed interior by two rectangular bays on the longitudinal axis and on each transverse axis. At both sides of the projections on the longer sides (on the diagonals of the domed interior) rise tower-like angle piers, that are crowned by small temples as bell turrets. The massive substructure stands in a well considered and harmonious proportion to the porticos with pediments (the columns have a height of 82.0 ft.), the small angle towers, the drum surrounded by columns and the dome. The church of S. Isaac makes a grand impression by its execution in granite, marble and bronze. Particularly on account of the extraordinarily difficult foundations on the marshy soil, the completion only occurred in the year 1858. The famous Kasan cathedral at S. Petersburg (1801-1811), erected by a native master, Andrej Niciphorowitsch Woronichin (1760-1814), closely resembles the church of S. Peter at Rome. It is a central building on the Greek cross plan (volume 1, page 153) with an apse, a hexastyle Corinthian portico with pediment and a high dome, that rises above the massive cornice crowning the drum. (Fig. 263). The church occupies the middle of a semicircular colonnade projecting from the facade, which is imitated from

those of Bernini on the church of S. Peter at Rome. The Kasan cathedral and the church of S. Isaac belong to the mightiest creations of Classicist architecture. Woronochin also built the Mining Academy at S. Petersburg with a duodecastyle portico toward the Neva.

Among the other masters, who took part in the extremely rich architectural activity in the Russian capital, we shall only name Rossi from Lugano and the German master, Leo von Klenze. (Page 286). More definite information concerning Rossi is wanting, but to him are referred a series of important secular buildings; the wide palace of the grand duke Michael (1819-1825) with plan arranged in U-form, and with a stately octastyle Corinthian portico with pediment on the middle axis (now utilized as the Russian Museum), and the Alexander Theatre (1832), whose front facade opens in a wide loggia of six Corinthian columns. Klenze came to Russia in 1839. He won there, as certain forms of details show, influence on the church of S. Isaac and created the Museum of the Hermitage (Fig. 264), a magnificent structure executed in costly materials. His treatment of forms within the limits of a severe Neo-Hellenism (the niche architecture of the facade is treated similarly to that of the Munich Glyptothek, but the plan and the structure already manifest a leaning toward the Italian high Renaissance.

In AMERICA, the "United States" stood in the foreground in political and intellectual respects, and after winning by war their independence from England, gradually sought to take their own course in architecture. On their first building for Congress, the "Capitol" at Washington, burned in 1814, it was believed that an American order had been created, which was decorated by cornstalks. As an example of early severe Classicism appears the Capitol in Richmond, for which the "Maison Carrée" (temple of Augustus) at Nîmes was a model. (Volume 1, page 140).

The influence of the English Palladian-Classicism could not be avoided by the architects of the new confederation even in the 19th century. The city hall in New York (1803-1812), the White House in Washington (1818), and the rebuilding of the Capitol at Washington (Fig. 265) after 1814, were erected in this style. After 1835 the Neo-Hellenism found entrance into

Washington. The new wings of the Capitol were erected (after 1851) by Thomas Walter (born 1804) and make a showy appearance with Corinthian columnar porticos and pediments in a purely Hellenistic treatment. The principal building of Girard College in Philadelphia was built by the same master, and harmonizes in external appearance almost completely with the church of the Madeleine in Paris (page 252). A series of other buildings in New York and other cities of north America are also creations of Neo-Hellenistic art.

Likewise the colonies founded by European states in foreign parts of the world, and everywhere that European civilization has won ground, we meet with similar architectural creations, that should produce a monumental expression of dignity and power, thus particularly palaces of the government and similar public buildings, with the form treatment of the Neo-Classicism. Thereby this most strikingly proved its character as an international world style, dominating the entire monumental architecture in its century.

511 Architecture of the Neo-Romantic and the Neo-Renaissance.

General Basis and Style.

However deeply it had even penetrated into the public opinions of its time, the intellectual and form world of the antique, which had received its stamp by the French revolution, could not quiet and permanently satisfy the artistic desires of the northern nations. The Germanic races, in whose art practice expression of their nature had previously formed an essential basis, experienced by the comparison of the Classicistic buildings with those of the middle ages a lack of poetic harmony, for which the purely formal beauty of the creations of antiquity could offer only an imperfect substitute. Likewise for critical scientific consideration, that gradually turned to the native art of the past, the recognition could not fail, that the Classicistic architecture could only appear as assumed and transferred from foreign soil, an external form unsuited to the keynote of national art imagination. The buildings of the middle ages, full of character and still standing visible in great number, formed without doubt an infinitely more characteristic expression of the Germanic nation, than that indeed in themselves proved but meaningless structures of Neo-Classicism, which clothed themselves in a garment, borrowed from the creations of pagan antiquity. On these the contradiction between the purpose and the internal plans of the buildings and the architecture given to them, ever became more manifest. Even enthusiastic adherents of Classicism gradually became doubtful in their faith in the competency and applicability of the architectural system of the antique to the works of modern architecture.

In the same measure increased the interest in mediaeval art. One must admit, that the difficulties resulting from the introduction of classical columnar architecture, restricted to definite proportions, into the structural framework, were avoided by the adoption of the infinitely freer members of the middle ages. Then it became clear, that just as impressive facades could be created with the form series of the middle ages, as well as interiors, which ~~not~~ only appeared as more comfortable and better corresponding to the northern climate, than by the

by the use of the open style of architecture of the South, but also by its harmony with the feudal middle ages producing an imposing impression, at least not inferior to that of Classicism. Thus it could not be avoided, that the rising movement in the intellectual world for the reanimation of the mediaeval art ideal found a favorable soil, and won an increasing number of adherents.

This movement took its start from literature, as formerly from the reaction against the Renaissance. England preceded in time. The standard of the national Gothic was not lost there, even in the 17th and 18th centuries (page 201). After Walter Scott had appeared before the public with his romances, thereby introducing the romantic tendency into literature, poetry had embodied in literature the churches, monasteries and castles of the middle ages. Likewise scientific investigation was early devoted to them. To the work "Monasticum Anglicanum" by Dodsworth and Dugdale (page 258) published in 1655-1673, John Stevens added ~~the~~ more volumes in 1723. Later appeared a great number of descriptions of mediaeval architectural monuments, which prove a lively interest in them in the 18th century. In the 19th century it was particularly the splendidly gifted younger Pugin (page 312), who with an enchanting gift of statement, understood how to give expression to his passionate veneration of mediaeval beauty, and kindled in the English people a strong inspiration for the reanimation of the national art of the higher middle ages. In France Victor Hugo had aroused a true enthusiasm for Gothic by his romance of "Notre Dame de Paris". A series of publications on mediaeval architectural works followed. In the year 1837 was established the "Committee on Arts and Monuments" for the preservation and investigation of the national art monuments. In Germany already in the 17th century the powerful and intellectual Würzburg prince bishop Julius Echter of Mespelbrunn had opposed the Gothic to the Barocco then existing in the Franconian lands. Numerous churches with pointed-arched portals, tracery windows, and with towers crowned by slender, tall and pointed spires are evidences of his influence, interesting in the history of art. About a hundred years later, at a time when Classicism was still in full bloom, the enthusiasm of the young Goethe

at Strasburg cathedral attracted general attention. * About the end of the century, it was principally Wilhelm Heinrich Wackenroder, who in his "Herzengießungen" (Outpourings from the heart of an art-loving monastic brother) (1797) and his "Phantasien" (Fancies on art), broke a path with youthful fire for the romantic tendency. Tieck followed him with his book, "Franz Sternbalds Wanderungen" (Franz Sternbalds' wanderings). (1798). Both works praise in a high key the splendor of mediæval art, as presented in the old German cities with their venerable churches and monasteries, the places adorned by artistic fountains, the winding streets with the statues of saints on the houses, showing the pious feelings of the citizens. The movement introduced by them in the beginning of the 19th century, ever more strongly swelling, then won a zealous assistance by the great circle of romantic writers, particularly by Hölderlin, Schlegel, Chamisso, Brentano, Achim von Arnim, Uhland and Kleist. The religious temper of the time strongly aided it. Gradually under the leadership of Grimm and Simrock, the figures of the German heroic sagas and the charming pictures of the German fairy tales supplanted the world of representation of the Grecian materials. This intellectual tendency also in Germany took under its control the formative arts. With ~~an~~ ^{variable} acquiescence in a problem recognized as high and of great importance, the architects commenced to make drawings of mediæval architectural works and to determine their nature. But considerable time elapsed, before men obtained an assured picture of the different stages of the evolution of the mediæval styles. First with the growth of the literature appeared a clarification. It was natural for men to not restrict themselves to the pure Romanesque and Gothic works of their native provinces, but to proceed further to the Early Christian art preceding the middle ages. Bunsen published (1842) a work containing drawings of the basilicas of Rome, and Quast a similar one on the Early Christian buildings at Ravenna. Both exerted a continuing influence. Soon afterwards appeared a series of German, English and French publications also on Byzantine and Saracenic art. The extension of the schematic tendency in the literature followed, although at some distance, the architectural creations of architects, About the middle of the 19th

century in Germany as in France and England, the architecture of the Neo-romantic style had already attained a high elevation in its evolution.

* *Goethe's Essay "Von deutscher Baukunst", D. M. Erwin a Steinbach* appeared in the year 1772.

But the mediaeval art ideal could not generally and permanently satisfy the architectural ideas of the modern time. In the evolution of the arts definite principles assert themselves as in that of the sciences, as soon as they have once won a solid following. And ~~these~~ were found in favor of the principles of form derived from the works of antiquity in the pupils of the classicists and in a great part of the academies, which after a judgment of the purely formal value of the beauty of antique and of mediaeval architecture, were not willing to yield their previously assumed standpoint. The antique had already secured for itself an assured place in the knowledge of art. Since it corresponded to the mode of research, derived more from the intellect than the feelings, after the ground of the antique in general (according to the state of science at that time) had been exhaustively treated, important men, learned in art, had consistently advanced to the series of Renaissance forms developed from the former. The French art literature herein preceded. In 1830-1840 appeared Letarouilly's work, "Edifices de Rome moderne", which gave new impulses in the sense of an introduction of the Italian Renaissance into French architecture. The native Renaissance also soon came into the series. These publications obtained importance for the further evolution of architecture. The Paris Academy of Art shone in new splendor as the starting point of the Renaissance movement. The architects cherishing the classical conception of art eagerly adopted the teachings coming from France. They had strongly combated the adherents of the Neo-Gothic style, and after Classicism had died out, declared the Italian Renaissance to stand far nearer to the social conditions and the spirit of the new times, than the mediaeval world of form belonging to a much earlier epoch. By them the Italian (pre-alladian) Renaissance was esteemed as the sole contemporary artistic ideal.

The separation in the aims of the leading architects thereby

produced had in the second half of the 19th century as a result, a permanent complication, that distinguishes the architecture of that century from that of all other times. Its evolution was most strongly influenced by that of the intellectual sciences. In these after the middle of the century and under the influence of sagacious men commenced a thorough advance. Instead of the subjective philosophy of the world and its phenomena, partly derived from feeling and from a dreamy, poetic temper, appeared a severe objective investigation clarified by more acute criticism. The universality previously striven for was replaced by a specialization, that sought to refine the methods by concentration on closely limited fields, and to make the individual dominant over its separate parts. The natural sciences (under the lead of Liebig, Darwin, Mayer etc.) obtained entirely new and highly important acquisitions. Also in the religious-philosophical domain (only Strauss and Feuerbach are mentioned), the criticism of the materials became dominant; history (after Ranke's precedence) devoted itself to thorough studies of the sources. In literature this critical conception likewise attained supremacy, and no less in the science of art. This saw its chief problem in the investigation of the historical past. Besides larger comprehensive works * appeared a series of important monographs from the domain of architecture. The richer the material, that the historian of art gradually collected from the countries of all monarchs, the more rapidly were filled the museums and collections of models, now founded in great number. Like the products of the entire art, like the composition of mankind itself, for whose racial families they should form a reflection, varied expositions were established in them.

* Among the works appearing in Germany the most prominent place is taken by Lübke's *Geschichte der Architektur* (History of Architecture; 1858) and Kugler's *Geschichte der Baukunst*. (History of Architecture; 1859).

The architects educated at the architectural academies, where architecture was treated purely as a science, by travel, by the study of publications on the history of art, and of art treasures examined in the museums, now endeavored -- they followed therein only a strict requirement of their time -- first

of all for historical truth, for complete purity of style; they saw the highest aim in the most thorough knowledge possible of the historical style and of its detail forms. The freely creating art imagination was supplanted by the condition in the history of the style, always looking backward like historical investigation. Since the art critic also took the questions of the purpose and worth of the different art styles for architectural creations in an objective way into the realm of his investigations, corresponding to the historical method of thought of the time, the conception soon became general, that the Romantic architecture formed the most striking form of expression for Christian church and national ideas, the oriental, and particularly the Moorish, that for the Israelite faith, etc. Thus an eclecticism entered into architectural creation, that in its results became fatal to obtaining an architecture full of character, and must lead to a chaos of styles, such as has not passed away. Not only the mediaeval styles and the Renaissance, but also the Barocco, the Rococo, and the Classicism, even to the Biedermeier style, came in the series. The "Neo-Renaissance" thus produced also comprised in a broader sense a renaissance of all historical styles. Many owners and architects then pleased themselves by erecting in Germany an English-Gothic villa, a Chinese garden house etc.; in the internal arrangements the style finally varied with the fashion. Men not seldom judged the skill of the architect by his mastery of all possible styles. In not a few cases attempts were even made to fuse together into a new style entirely dissimilar forms elements, such as those of classical and of mediaeval architecture. Thus originated deformities, if these experiments were not conducted with a refined artistic feeling, that in a rude way proved the artistic restlessness of their creators. In the employing and purchasing "art-loving" public gradually occurred a scarcely credible lack of restraint. For the internal architecture and the art industries were established all conceivable requirements. The consequence thereof was a hasty, purely external and frequently misunderstood inclination toward the most striking characteristics of the art style, and a combination of these in the house utensils in an arrangement in an arrangement and abundance, in which frequently could no

longer be a suggestion of organic development. This mimicking led to imitations and deceptions of every kind. Substantial technics were also lost and sound taste, which was even worse.

This dangerous outgrowth of the conditions in the architecture of the second half of the 19 th century particularly appeared in Germany and indeed in the art of the wide masses of the people, since there all unified culture of taste and leadership were wanting. As we shall see later, France had retained a more ~~assured~~ foundation by a stronger adherence to its traditions, and by a strong emphasizing of suitability in plan and architectural treatment of its buildings. But also concerning the architecture of Germany cannot be expressed a final decision in the preceding respects. In the view of its shady side, we must not overlook the great works of a stately number of architects of high aims, during a period characterized by an extremely rich architectural activity. We have observed the fact in the entire course of the evolution of architecture, that every time, considered by itself, was at least tolerant of the directly preceding art style overcome by itself. Our present time certainly makes no exception in that respect. We now stand too near to the second half of the 19 th century, to obtain an assured objective decision on its architecture. But we shall come near to a just determination, if we consider it in the light of its time. And this was severely historical and purely scientific. In its spirit certain important masters have truly accomplished great things. They have created in numerous buildings excellent solutions of the ground plans, splendid compositions of interiors, and reached a refinement of forms, such as ever show their development, with a high flexibility. Their works are often so faithful in their imitation, that they might be regarded as genuine. There may be recalled here only the extension of the great mediaeval cathedrals, particularly that of Cologne cathedral, and the activity of the recently founded masons' lodges (volume 2, page 73), who penetrated deeply into the nature of mediaeval art. On the other hand, certain masters have honestly and successfully endeavored to bring into use the native Renaissance, thus to obtain a permanent art standing nearer the modern times. Oth-

Others employed for their buildings freely designed motives, so that they regarded them as entirely new. Indeed by these creations the general appearance of architecture in the last half of the 19th century was not determined. This presents in a far greater measure the products of an antiquarian conception of art, based on the inclination toward continued reanimations, the parts of a dead world again brought to life, which like foreign bodies are intruded into the natural course of evolution of architecture. We shall not recognize such phenomena as the fruits of the living tree of the art of a country. And therefore they lose in interest for the consideration in art history in a work, that in the first line regards the side of the historical evolution of architecture. It will suffice for our further treatment, if we follow the paths struck out in the different countries by the most prominent masters, and refer to their most important architectural creations.

Evolution in the different Countries and the Monuments.

3. I. Germany, Austria and Switzerland.

In Germany already at that time, when Neo-Classicism was in its highest bloom, the Neo-Romantic appeared in architecture, and it was just the most celebrated master of the former, the talented Friedrich Schinkel (page 282), who created the first important Neo-Gothic architectural work, the Werder church in Berlin (1825). It is a one story plan, consisting of five bays with a narrow outer aisle and galleries between the buttresses, which are drawn inward, a polygonal choir and two front towers terminating in platforms. * Likewise the further works of the Neo-Romantic in Berlin and its immediate vicinity have architects as their creators, which we have mentioned among the principal masters of Classicism. There are in Berlin the S. Matthias church, erected by Stüler (page 285) as a Gothic hall church in 1845-1848, a brick structure with tower on the principal axis, and the extensive Romanesque central building of the church of S. Markus (begun 1848) by the same master, and in general recalling the palace chapel at Aix-la-Chapelle, and further in Sanssouci the harmonious Friedens church, built (1803-1805; page 235) by Ludwig Persius in the style of the Early Christian basilica. The very busy Stüler also appeared as adherent of the Neo-Renaissance. He was (after 1848)

the architect of the palace in Schwerin, begun in 1844 by the court architect there, George Ad. Demmler, which in the form of its plan and architecture, particularly also in the animated outlines had as a model the French chateaus of the early Renaissance. (Fig. 266).

* Schinkel's inclination toward Gothic, with the clarity of his thinking, indeed did not have its origin in the enthusiasm of that time for the "Romantic", but rather first in respect to the monumental treatment of the vaults, and perhaps to the picturesque effect of the style. But his knowledge of Gothic was not derived exclusively from German, but likewise from English sources. Indeed corresponding to the stage of art research at that time, he did not penetrate deeply into the nature of Gothic, but remained attached to a purely external conception.

An important centre of Neo-Romantic architecture became Munich, the Bavarian capital. There Klenze (page 236) already in the year 1837 erected at the particular desire of the king Ludwig I, near the Royal palace the three aisled Allerheiligen court church in the Romanesque basilican style. Gärtner (page 238) was engaged on it, and erected the Ludwigs church (1829-1843) as a cross basilica with portico and two front towers in a still quite immature style, in mixed German and Italian Romanesque forms, into which even Gothic forms are interwoven. The elongated Library (1832-1843), externally very tasteless, has a facade composed of Tuscan forms of the Romanesque and the early Renaissance styles, but has a beautiful stairway hall, still chiefly Classicistic in design. At the Commanders' portico (Feldherrenhalle) (1841-1844) Gärtner attempted an unfortunate copy of the Loggia dei Lanzi at Florence for the Munich Place. Jos. Daniel Ohlmüller (1791-1839) penetrated much deeper into the nature of mediaeval art. His chateau of Hohen Schwangau is a very charming creation with all naivety, which combines Romanesque and Gothic motives. The church of Marienhilf in the meadow near Munich (after 1831), he erected as a hall structure of brick with cut stone details. The tower rising above the facade already has a tracery spire. After the early death of Ohlmüller, Geogre Fried. Ziebland (1800-1873) completed the building. From him also comes the church of S.

Honifazio (Fig. 237) erected 1835-1840 in Munich after thorough studies of the Early Christian style with open portico in grand and harmonious proportions, as a five aisled basilica in the Early Christian style. To the Art Exhibition building erected opposite the Glyptothek (completed in 1845), he gave, as being a pendant to that, a middle octastyle temple facade rising above the remainder of the structure, with pilasters subdividing the recessed portions. The Italian Renaissance also found early entrance into Munich. Klenze built in that style the Old Pinacothek, a work long esteemed a model for a pictura gallery, and the Royal Building (1826-1835) as an extension of the palace in a direct imitation of Palace Pitti. (Fig. 268).

In Nuremberg Carl Alexander von Heideloff (1788-1855) worked as a Gotnicist, who developed a rich activity in the reanimation of the German Gothic and restored a series of churches, also executing new churches and chateaus, among others the well known chateau of Lichtenstein in Wurtemberg (completed 1842).

Carlsruhe-i-B. had in Heinrich Hübsch (1795-1863) and Fried. Eisenlohr (1805-1854) two esteemed and learned representatives of mediaeval art. The former was a Romanticist and as such was more important than Gärtner in Munich. He built in Carlsruhe, among other works, the Polytechnic school (1833-1835), the Art Hall (1836-1845), the Court theatre (1851-1853), and in Baden the Casino (Trinkhalle). Hübsch restored the cathedral at Spire and erected several churches (at Sulach, Freiburg-i-B. and Rothenburg). Eisenlohr was partly engaged as a Romanticist, but chiefly as a Gothicist. He became known by the structures of the Baden railways, particularly the stations at Carlsruhe, Heidelberg and Freiberg, and especially by his much used "Ornamentik in ihrer Anwendung auf das Baugewerbe. (Ornament applied to Construction).

In Vienna Carl Rössner (1804-1859) stood on the stage of the transition from Classicism to early Romanticism. His church of S. Johann there (1842-1846) is still chiefly Classicistic in the facade, and is subdivided by pilasters, but the slender octagonal tower rising above that is treated in Romanesque. As further advanced in the mediaeval series of forms, he showed himself on the cathedral at Biakowar in Slavonia. George

Müller (1822-1849) unfortunately died too early, but he designed and commenced the beautiful church at Altlerchenfeld near Vienna (1848-1861), a cross basilica with two towers, and a dome over the crossing; it exhibits the developed forms of the Lombard-Romanesque style.

In the second half of the 19th century, after the experiments made in Munich in particular for obtaining a "new style" had passed without much result, men decided during the first decades to adhere ever more closely to the historical forms of the style, that were also taught at the academies. They were employed purely at discretion. Catholic church architecture firmly adhered to the mediaeval models corresponding to the particular requirements of its worship. Protestantism frequently inclined to the central building with galleries, with the most thorough regard to hearing the preacher. But under the Romantic tendency of the time, men were still too strongly affected by the harmonious entirety of the mediaeval-Catholic churches and by the regard to "purity of style", to advance to entirely free creation, as the English-Protestant sects have done (page 344). Men rather believed they might come nearer by an approximation to the historical tradition, and should also express the spiritual connection with the opinions of earlier times also in art. They turned to the Early Christian church architecture with particular interest, and therefore like this, chiefly took the basilican type as a model. The time showed itself extremely liberal toward church architecture. This may be seen by the extension of the great mediaeval cathedrals (at Cologne, Ulm, Regensburg etc.), on which German architecture has completed highly esteemed works, even if these no longer receive full approval from the present representatives of a severer criticism in the history of art.

In the unusually flourishing cities, particularly since the political and economical union of the German races after the war of 1870-1871, there appeared from the continual search for novelties, that diversity in architectural creations with the excrescences conceivable, to which we have already referred. (Page 316).

About the middle of the 19th century a very important master had assumed a dominant position, scarcely inferior to Schin-

Schinkel, but even superior to him in the treatment of interiors, the talented Gottfried Semper (1803-1879). He was born in Hamburg in 1803, studied mathematics from 1823 in Göttingen, and from 1825 architecture in Munich (with Gärtner), then worked 1826-1830 in Paris with Gau (page 337), undertaking in the following years study tours to Italy and Greece. In the year 1834 he was called to Dresden as professor in the Academy of Art, which through him won a leading importance. To his grounds and designs the developed Italian Renaissance corresponded better than any other art style. He was a path-breaker in his time. put in the mode of composition and the treatment of interiors, he approached the models of the Roman antique, particularly those given by the Baths. He also adapted his buildings in the happiest manner to the location and to the effect in their surroundings. In Dresden Semper created the Court Theatre (1838-1841), on which he allowed the audience room to project externally in a semicircle, surrounded by a two story aisle opening with great round-arched windows. The carriage entrances and the flights of steps he placed at the two longer sides. The architectural treatment was that of the commencing Italian high Renaissance. Semper further erected in 1845-1848 the Oppenheim city palace at Dresden with evident regard to the palace Pandolfini at Florence, and he designed the Gallery of Paintings to enclose the open side of the court of the Zwinger palace in a festal Italian early Renaissance (Fig. 269), which nevertheless did not attain to the effect of Böppelmann's architecture on the Zwinger side. The execution began in 1847. Semper only had charge of it until 1849. In consequence of his participation in the political revolt, he fled to Paris, but in 1851 went to England, where he assisted in the organization of the World's Exhibition, and as adviser of the prince consort, and instructor in the recently founded school for practical art, exerted a determining influence upon English art industries. In the year 1855 he obeyed a call as professor of architecture at the Polytechnic school in Zurich. There he created the new building of the polytechnic school (1858-1863) and the Capitol in Wintertur (1865-1866). On these buildings appears an approximation to the Palladian style. The Theatre in Dresden, previously erected by him, burned in 1869. Semper was entrusted

with the new building (1870). He adhered to the old ground plan in general, but enlarged the design and gave to it a heavier and richer treatment. The execution Semper placed in the hands of his son Manfred in 1871. He himself transferred to Vienna in that year, in order to assist in the grand remodeling of the city. Repugnant conditions and illness caused him to leave this field of labor in 1876. His remaining years of life were chiefly spent in Italy. Rome gave to him his last resting place near the pyramid of Cestius. Semper was an energetic nature and was equally important and influential as a writer as an executing architect. The ground principles that he evolved in his "Style" in the technical arts likewise today possess an almost unlimited acceptance.

In Dresden, aside from his son Manfred, who completed the Court theatre in 1878, Semper was followed by Hermann Nicolai (1817-1881), who is chiefly represented by the house and villa architecture of the royal family. His successor Constantine Lipsius (1832-1894) erected the Academy of Art in Dresden in the spirit of Semper, yet with the addition of Venetian high Renaissance and certain Barocco motives. A great advance first came to Dresden architecture through Paul Wallot, born in the year 1841 in Oppenheim-a-Rh., who was educated at the Polytechnic school in Hanover, the Academy of Art in Berlin, the University at Giessen, and finally with Gropius, Hitzig and Lucae in Berlin. By him was the stately Representatives House on the Brühl terrace, which with well calculated effect was added to the great general view of Ghiaveri's court church, Semper's Court theatre and the Palace. In Frankfort-a-M. several finely designed buildings in the character of the German Renaissance have him as their creator ("city of Ulm" and groups of houses of the International Building and Railway Society in the Kaiserstrasse).

Wallot created his most important work in Berlin. There since the middle of the century, the Neo-Romantic tendency was represented by a series of masters, chiefly engaged in church architecture. Aug. Soller (1805-1853) built the Catholic church of S. Michael as a cross-shaped three aisled hall church with a beautiful dome over the crossing in predominating Lombard-Romanesque forms. He was followed by Friedrich Adler (

(1827-1903), but who for his Protestant church of S. Thomas in Berlin (1864-1869) also adopted Rhenish motives, particularly the dwarf galleries at the main cornice (Fig. 270). Adler introduced a notable innovation in the ground plan. The buttresses were drawn inward and divided into two detached supports, so that narrow side aisles result, which afford access to the rows of seats. Thereby a form of plan was created, suitable for Protestant worship, which soon found imitation by Aug. Orth (1828-1902) in his Zion's church in Berlin (1866-1873), and also later in some Gothic churches by Hase in Hanover (page 326). Likewise Joh. Otzen (born 1839), who introduced in Berlin brickwork with the use of colored bricks in the Kreuz church, a central building, arranged the side aisles in somewhat greater dimensions. Spitla erected his Gnaden church in Berlin (1891-1895), combining the cross plan with the central structure, in the Rhenish-Romanesque style of the best period, and Franz Schwechten the Kaiser Wilhelm memorial church (1891-1895) there, in that of the late period.

In contrast to the masters mentioned above stand the adherents of the Neo-Renaissance, chiefly engaged in secular architecture, among whom is first Fried. Hitzig (1811-1881), the creator of the Bourse (1859-1863; fig. 271), which is kept in the style of the Roman high Renaissance with suggestions of the Louvre facade; then Richard Lucae (1829-1877), who built in Frankfurt-a-M. the Opera House in an elegant Italian high Renaissance (1872-1880), and planned the Technische Hochschule (Polytechnic University) in Charlottenburg in the same style, whose execution after his death was in charge of Hitzig and Julius Raschdorff. Raschdorff became particularly known as the creator of the greatest church building of the capital of the empire in the 19th century, the cathedral at Berlin (1894-1905), whose effect was injured by the superfluous and frequently inorganic combination of the architectural details in the forms of the Italian high Renaissance. Martin Gropius (1824-1880) sought on the Kunstgewerbe (Art Industry) Museum in Berlin (1877-1881), sought to create a Hellenistic-Renaissance, and to impart to it an individual life by the use of colored materials, especially by terra cotta, without thereby securing entirely satisfactory results. He was more fortunate in the